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No. 3

INVASION OF THE INTRACRANIAL VENOUS SINUSES BY MENINGIOMA (DURAL ENDOTHELIOMA)

BY EDWARD BANCROFT TOWNE, M.D.

OF SAN FRANCISCO, CAL.

FROM THE DEPARTMENT OF SURGERY, STANFORD UNIVERSITY MEDICAL SCHOOL

THE meningioma is an encapsulated tumor which compresses, but does not invade the brain, and which is not known to metastasize. It frequently invades the dura and the overlying cranial bone. If the involved dura and skull are removed at operation, the tumor will not recur. Proliferation of the skull as a result of tumor infiltration is not a serious complication, provided that it is in a region accessible to surgery; in fact, it may call attention to the possibility of an underlying tumor compressing a "silent" area of the brain.

Meningiomas arise from nests of arachnoid cells, and very commonly from those which accompany the arachnoid villi, which pierce the dura and project into the venous sinuses. It would seem, therefore, that a tumor arising from the cells of a villus might invade the vein. Cushing¹ has reported such a case. The tumor, which arose from the wall of the superior longitudinal sinus, invaded the vein without thrombosing it. As no other example of venous invasion has been found in the literature, it seems advisable to record two instances of this condition. In the first case the extent of the growth in the venous system is unknown, as the invasion of the sinus was an operative finding; but in the second case necropsy showed very extensive invasion of the venous system, and secondary growth through the walls of the occluded veins into the surrounding tissues. In this, and perhaps in the first case, the involvement of the blood-vessels precluded the possibility of complete surgical removal of the tumor.

CASE REPORTS

CASE I.—*Bilateral parasagittal meningioma compressing the frontal lobes; proliferation of the overlying skull; invasion of the superior longitudinal sinus. Removal in two stages. Death three months later. No necropsy.* R. Z., a man aged thirty-two years, married, a laborer, entered the Neurological Ward of Lane Hospital, March 15, 1923, complaining of failing vision.

History.—He had been working as a logger until two weeks before admission. Eight years previously he had received a blow in the midfrontal region. He believed that the swelling on his forehead was the result of this injury. The right side of the face had been numb for four weeks. Dimness of vision, especially in the right eye, had been noticed for three weeks. There had been no headache, double vision, nausea or vomiting.

¹ Cushing, Harvey: The Meningiomas (Dural Endotheliomas). Their Source and Favoured Seats of Origin. *Brain*, 1922, vol. xlvi, p. 282.

Examination.—In the midfrontal region there was a large tumor (Fig. 1) which extended farther to the left than to the right. The overlying scalp was freely movable. The scalp veins in the frontal and temporal regions were markedly enlarged. The tumor was hard peripherally and soft centrally, without pulsation or fluctuation. Röntgenograms of the skull showed peripheral proliferation and central destruction of the involved bone. The sense of smell was not impaired. Visual acuity of the right eye was 20/50, and of the left, 20/100. There was bilateral papilloedema of three to four diopters, with some secondary pallor. The right pupil reacted normally to light, and movements of the right globe were not restricted. The left pupil was dilated and reacted only slightly to light, and there was weakness of the left internal rectus muscle. Sensation was absent in the cornea and in the distribution of the superior maxillary branch, and diminished in the remainder of the territory of the right fifth nerve. The motor portion of the nerve was normal. The remaining cranial nerves were normal. Examination of motor and sensory functions and reflexes showed nothing abnormal. Memory and orientation were slightly impaired. Wassermann reactions on the blood and spinal fluid, and all other laboratory tests, were negative.



FIG. 1.—Case 1. Photograph of the patient.

tions and of euphoria. During week that psychosis lasted general condition was excellent.

Second Operation.—April 9, the intradural tumor was removed under general anaesthesia. Dural involvement was so extensive that the membrane was removed almost to the edge of the bone defect. About two-thirds of the tumor lay on the left side of the falx (Fig. 3). It was nodular, soft, reddish-brown in color, and quite adherent to the pia. The superior longitudinal sinus was ligated at either end of the mass. The sinus, when cut through, was seen to be filled with soft, yellowish tissue (Fig. 4) which was thought to be organized clot following the first operation. The intradural tumor weighed 143 grams and measured 11 by 9 by 5 cm. Sections of the superior longitudinal sinus showed that the supposed clot was actually meningioma, which filled and occluded the sinus throughout the excised portion. The wall of the vein was invaded, and the tumor within the sinus was continuous, in many places, with that infiltrating the surrounding dura. The tumor cells were spindle-shaped, and had a marked tendency to form whorls, many of which were fibrous, and a few calcified.

MENINGIOMA INTRACRANIAL SINUSES

The patient's condition was satisfactory for a week; after that he began to fail, both physically and mentally. He died on June 12, 1923, two months after the second operation. Necropsy was not obtained.

CASE II.—Meningioma of the falx cerebri; invasion of the inferior longitudinal sinus; extension into the straight, superior longitudinal, right and left lateral sinuses, left internal jugular and innominate veins, and superior vena cava. Secondary invasion of perivascular tissues. Sudden death. Necropsy.
L. T., a woman aged fifty-four years, married, a housewife, entered the medical ward of Lane Hospital, March 20, 1925, complaining of nervousness, irritability, loss of interest, pains in the chest, and dry cough.



FIG. 2.—Case 1. Transverse section of extradural tumor.

History.—She had been exceptionally well until a year before admission. She had six living and healthy children. A small, tender mass appeared in the left side of the neck early in 1924. The tumor was removed in July, 1924. Dr. Frederick Proescher, of San Jose, kindly furnished the following pathological report. "Tumor 8 by 2 by 1 cm., of a firm consistency and covered by a smooth capsule. On section, the cut surface was smooth, and grayish-white to grayish-red in color. Microscopically, it consisted of spindle-shaped cells arranged in strands and whorls. Some of the whorl formations contained a colloid-like substance. Here and there were a few gland-like structures with a distinct lumen,



FIG. 3.—Case 1. Inferior aspect of intradural tumor.

lined with a single layer of cylindrical epithelial cells. Diagnosis: Endothelioma of the carotid gland." The patient received eleven Röntgen-ray treatments. She became nervous, irritable and depressed, with loss of ambition and enthusiasm. She was easily

upset, and often wept without cause. For three months she had been troubled by an unproductive cough. There had been no headache, vomiting or visual disturbances.

Examination.—A well-nourished woman of apparently normal intelligence. The

pupils were equal, and reacted to light and in accommodation. Movements of the eyeballs were normal. Watch tick was heard on the right at a distance of 3 feet, and not heard on the left. There was a linear scar, 2 inches long, running downward from the angle of the left jaw. Examination of the heart, lungs and abdomen showed nothing abnormal.

FIG. 4.—Case 1. Posterior aspect of intradural tumor. Superior longitudinal sinus filled with tumor.

The blood-pressure was 160/90. The elbow and knee-jerks were active and equal. Blood examinations and urinalysis were negative. The temperature was 98.6, the pulse rate 64, and the respiratory rate 18. This was the complete record, except the spinal fluid examination. The interne's preliminary diagnosis was involuntary melancholia.

A spinal puncture was done March 21 at 10 A.M., with the patient in the sitting posture. The amount removed was 10 c.c. The cell count was less than 1 per cmm., and the Wassermann, Nonne and Noguchi reactions were negative. The patient vomited several times during the afternoon and night. At 8 A.M., March 22, she complained of a severe headache. At that time the pulse was 64, the respirations 18, and both were regular. At 8:15 she was unconscious, with a weak, irregular pulse and rhythmic respirations. After a period of artificial respiration the heart stopped. It beat again for ten minutes following the injection of 1 c.c. of epinephrin into the left ventricle, but a second injection had no effect.



FIG. 5.—Case 2. Tumor between cerebral hemispheres, deforming the right. Indentation of left occipital pole and of cerebellar hemispheres by pressure of secondary intradural nodules.

MENINGIOMA INTRACRANIAL SINUSES

Necropsy.—The examination was negative except for the following findings. There was a thin subdural clot over both frontal lobes, and a subpial extravasation at the right occipital pole. The convolutions of the cerebral hemispheres were markedly flattened. Attached to the falx cerebri was a tumor measuring about 6 cm. in all diameters (Fig. 5), which made a deep indentation in the postero-mesial aspect of the right cerebral hemisphere, without invading the pia-arachnoid. The surface of the tumor was rough. Its inferior aspect was adherent to, but did not invade, the corpus callosum. The tumor was attached, over an area measuring 1.5 by 2 cm., to the right wall of the inferior longitudinal sinus and to the falx, just in front of the junction of the falx and the tentorium cerebelli. The tumor was broken when the dura was removed; the portion attached to the falx is shown at A in Fig. 6. This part of the tumor extended up alongside the superior longitudinal sinus, but its attachment was only along and adjacent to the inferior longitudinal sinus (Fig. 7).

The inferior longitudinal sinus posterior to the point of attachment, and the straight sinus, were filled with tumor which was firmly adherent to the wall of the veins. The straight sinus emptied into the left lateral, and the superior longitudinal into the right lateral sinus. The confluence of the sinuses was filled with tumor, which here broke through the sinus walls in four directions, forming three intradural and one extradural masses. The intradural nodules were 1.5 to 2.5 cm. in diameter, and lay in the angle between the left aspect of the falx cerebri and the tentorium; and, below the tentorium, on either side of the falx cerebelli (Fig. 6, B,C). These nodules caused small depressions in the left occipital pole and in both cerebellar hemispheres (Fig. 5). The extradural invasion lay directly over the torcular and perforated the skull, forming an eroded area 1.5 cm. in diameter.

The tumor in the sinuses extended from the confluence in three directions: (1) completely filling the posterior portion of the superior longitudinal sinus (Fig. 7) to a point 3 cm. from the torcular, anterior to which the sinus was empty; (2) partly filling

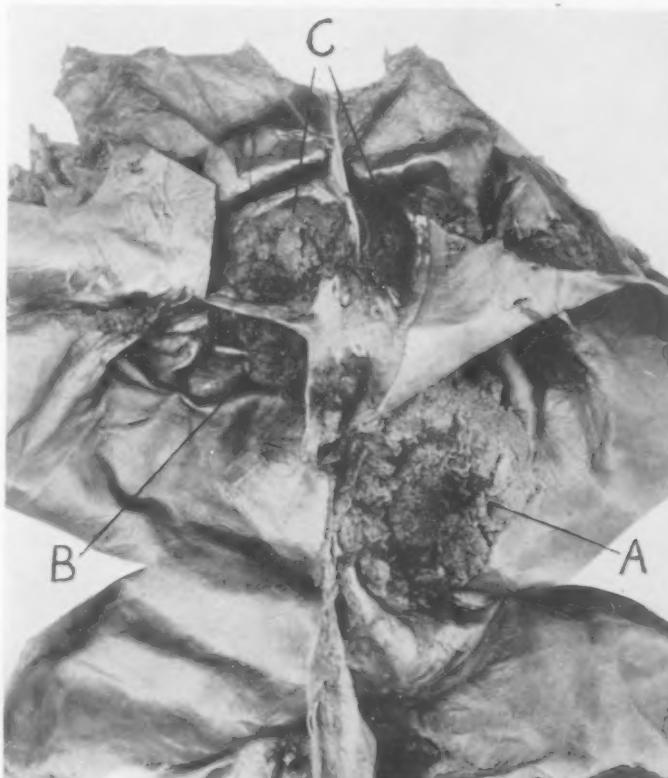


FIG. 6.—Case 2. Inferior aspect of dura. Left side of tentorium cut. A, primary tumor attached to falx. B and C, secondary nodules above and below tentorium.

the right lateral sinus for a distance of 5 cm. from the torcular; and (3) completely filling the left lateral sinus. Just posterior to the petrous portion of the left temporal bone the tumor broke through the outer wall of the sinus and invaded the skull. The left internal jugular vein (Fig. 8) and the left innominate vein were filled with tumor.

The tumor extended a short distance into the superior vena cava, but did not obliterate its lumen.

Microscopic Examination.—The tumor cells were spindle-shaped, and showed a marked tendency to form whorls. Some whorls were made up entirely of cells, some surrounded small blood-vessels, some showed hyaline degeneration at the centre, and a few were fibrous or calcified. In the jugular vein the cells were arranged in bands, resembling a sarcoma, and rarely formed whorls. Mitotic figures were common. In places there were multiple mitoses, resulting in giant cells. The supporting stroma was scanty and very vascular. The intradural tumors, and some of the intravenous tumor, had a thin fibrous capsule. Other portions of the intravenous tumor, as in the straight and left lateral sinuses, had no capsule; they broke through the wall of the vein. In places, encapsulated masses of tumor cells grew out, like buds, from the adventitia of the vein (Fig. 9). The cervical lymph-glands did not show tumor invasion. In the superior longitudinal and right lateral sinuses the method of extension of the tumor could be studied. The

process was one of invasion of organizing thrombus by tumor cells (Fig. 10), with the formation of a limiting capsule which temporarily separated the tumor from the intima of the vein.

It is interesting to speculate whether the tumor removed from the neck in 1924 was an extension of the process which was later found to involve the left jugular and innominate veins. Doctor Proescher's description of the histology corresponds closely with our findings, except that we did not see any gland-like structures lined with cylindrical epithelial cells.

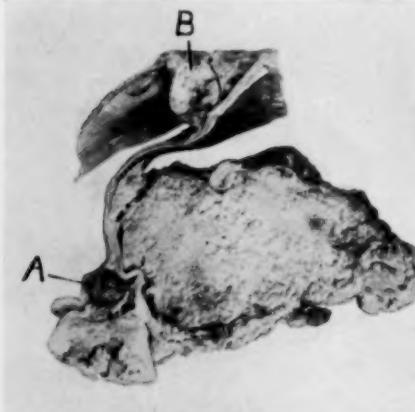


FIG. 7.—Case 2. Transverse section through attachment of tumor to wall of inferior longitudinal sinus, A. B, superior longitudinal sinus filled with tumor.



FIG. 8.—Case 2. Transverse section of left internal jugular vein, filled with tumor

MENINGIOMA INTRACRANIAL SINUSES

SUMMARY

Meningiomas, or dural endotheliomas, are encapsulated tumors which do not invade the cortex, but which frequently invade the dura and the overlying cranial bone. They arise from nests of arachnoid cells which often lie on the arachnoid villi, which project into the intracranial venous sinuses. Theoretically, meningiomas might invade the venous sinuses of the dura. Only one example of invasion, without occlusion of the sinus, has been found in the literature. Two additional cases are reported.

In one, the superior longitudinal sinus was occluded. In the second, a meningioma had invaded the inferior longitudinal sinus and grown extensively in

the venous system, terminating in the superior vena cava. The tumor had secondarily invaded and broken through the venous walls in many places.

Such invasion of the venous system may convert a meningioma, which is otherwise favorable for surgical treatment, into an irremovable



FIG. 9.—Case 2. Photomicrograph $\times 13$. Encapsulated mass of tumor budding off from adventitia of internal jugular vein.

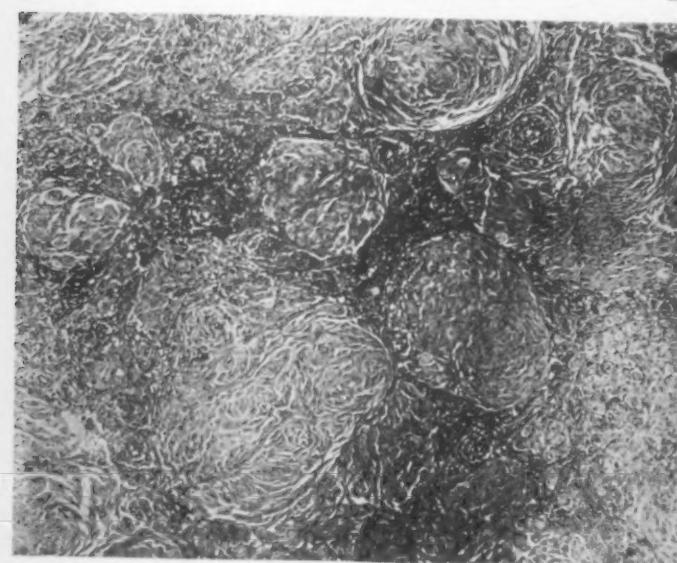


FIG. 10.—Case 2. Photomicrograph $\times 110$. Tumor cells invading organizing thrombus in superior longitudinal sinus.

tumor. The surgeon should examine the adjacent venous sinus for possible involvement when the tumor is attached to the dura. Necropsy in the second case suggested that an early intravenous extension, before secondary invasion of the wall of the vein, might be successfully excised.

GIANT-CELL TUMOR INVOLVING PHALANGES

BY WALLACE H. COLE, M.D.

OF SAINT PAUL, MINN.

IN THE ANNALS OF SURGERY for April, 1925, Vermooten reported a case of giant-cell tumor of the thumb, of the xanthosarcoma variety. (Following Ewing's classification.) The rarity of such tumors in the phalanges was dwelt upon, as a review of the literature seemed to show only one other reported case and that was a giant-cell tumor, of the epulis type, in the terminal phalanx of a toe, reported by Bloodgood. A new search of the literature by the present author has failed to reveal any additional reports, but personal observation adds two cases to the list. One of these involved the proximal phalanx of a toe and the other the proximal phalanx of a thumb, both of the growths being typical giant-cell tumors or, following Ewing's classification, the epulis type of giant-cell sarcoma. These tumors can not be as rare as the literature suggests and it must be that the failure to report cases leads to this false assumption. In Bertmistle's book of Radiography there is a reproduction of a plate (No. 162), with a diagnosis of myeloma, which

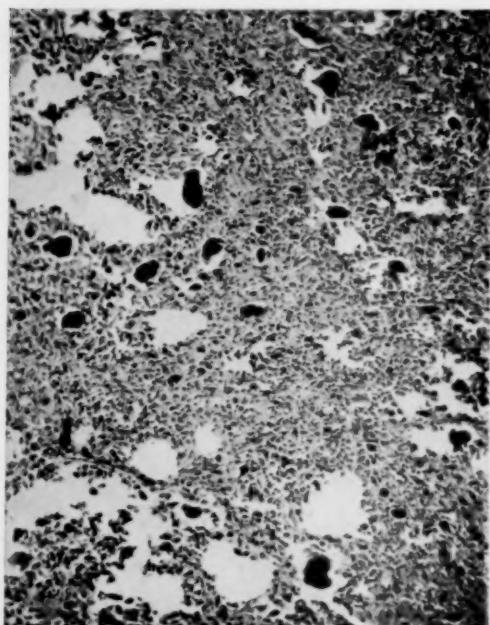


FIG. 1.—Photomicrograph of giant-cell tumor of proximal phalanx of toe cured by amputation.

case probably belongs to this group, but no history or pathological findings are given, so it can not be accepted as authoritative. The cases to be reported follow:

CASE I.—Mrs. A. W., a woman twenty-seven years of age, Italian, reported at the hospital in April, 1920, on account of discomfort in the fourth toe of her left foot of two years' duration. During this time there had been gradual enlargement of the base of the fourth toe and intermittent pain was present after use of the foot in walking or standing.

Examination showed a soft, almost fluctuating mass involving the proximal phalanx of the second toe with apparent enlargement of the phalanx. There was no tenderness and apparently no joint involvement. The röntgenograph showed a rarefying and expanding lesion of the proximal phalanx of the second toe with a breaking through of the cortex. A diagnosis of tumor or tuberculosis was made.

April 16, 1920, the toe was amputated. The pathological report on the specimen was:

GIANT-CELL TUMOR INVOLVING PHALANGES

"Tumor involves the marrow of the proximal phalanx of the toe and presents outside the bone dorsally as a lobulated tumor about $3 \times 1 \times 1$ centimetres. The tumor is soft and red. Microscopic section shows a typical giant-cell tumor." (Fig. 1.) The ampu-



FIG. 2.—Röntgenogram of giant-cell tumor of proximal phalanx of thumb, lateral view.

tation wound healed normally. Patient was last seen in November, 1925—five and a half years after operation—and is apparently well, there being no signs of local or glandular recurrence of the tumor.

Unfortunately, the röntgenological plates were destroyed and the gross specimen lost

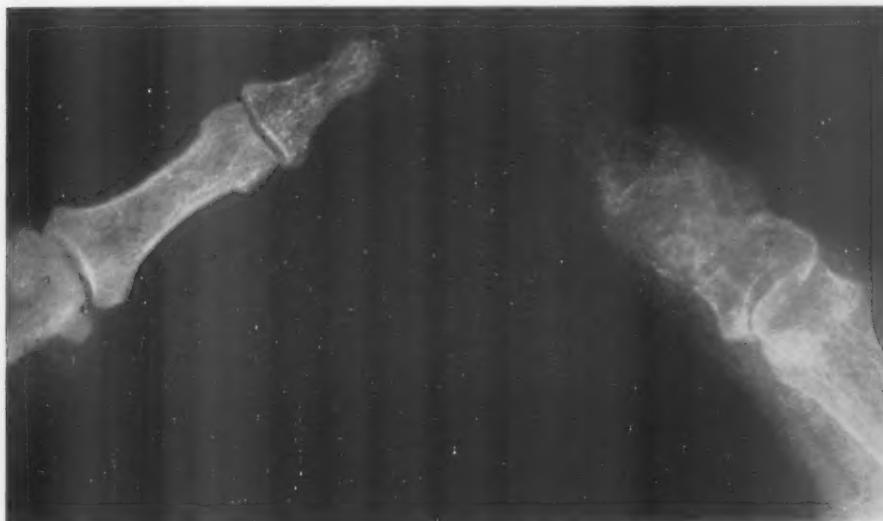


FIG. 3.—Röntgenogram of giant-cell tumor of proximal phalanx of thumb, antero-posterior view.

at the hospital, so that the microscopic section only is preserved. An examination of Fig. 1, which is a photomicrograph of a portion of this section, can leave no doubt that the diagnosis of a benign giant-cell tumor was correct.

CASE II.—Mrs. K., a woman fifty-four years of age, reported for examination on August 9, 1924, complaining that the right thumb was swollen but not painful and that her family physician had diagnosed the condition as an osteomyelitis and had prepared to operate and probably amputate the thumb. The swelling started without any apparent cause, in October, 1923. There was no pain and the only treatment undertaken was to paint the thumb with iodine. It was noticed very early that the thumb was tender and

that it could not be used as freely as before. A splint was used on the thumb for a short time without any relief from the swelling or tenderness. The condition apparently had been stationary for the three months preceding the examination. The history otherwise was absolutely negative and a thorough examination at one of our large clinics, some time previously, was reported negative.

Examination showed a definite thickening of the right

FIG. 4.—Drawing of gross specimen of resected phalanx of thumb, the seat of a giant-cell tumor.

thumb in the region of the proximal phalanx. Measurements showed a two centimetre increase in circumference around this portion of the thumb, as compared with the left thumb. There was slight tenderness on deep pressure over the swelling and the swelling seemed to be bony in consistency. No crepitation was elicited. The distal joint was held straight and only about five degrees of motion was possible in the direction of flexion. There was also a slight limitation of motion in the metacarpophalangeal joint. A röntgenological examination showed the proximal phalanx of the thumb enlarged by expansion but with definite areas of bone destruction, especially in the distal one-half and with bony trabeculae running through the base. (Figs. 2 and 3.) A diagnosis of bone cyst or giant-cell tumor was made and operation advised.

Operation: August 14, 1924. A rubber-band tourniquet was applied to the base of the right thumb. Through a dorso-lateral incision the proximal phalanx of the thumb was exposed and removed *en masse* without cutting into the tumor mass at any point. The bony cortex was found completely destroyed at the distal end of the phalanx and there was a bulbous projection of tumor at this point, which was firmly encapsulated. A small piece of bone was resected from the right tibia and covered with periosteum

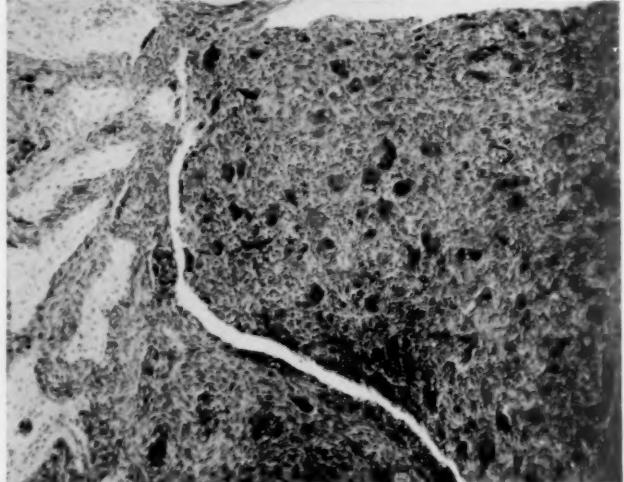


FIG. 5.—Photomicrograph of giant-cell tumor of proximal phalanx of thumb.

GIANT-CELL TUMOR INVOLVING PHALANGES

on all sides and one end. This graft was then wedged into the distal end of the metacarpal bone of the thumb which had been split to receive it, the end covered with periosteum resting against the proximal end of the distal phalanx. The graft was easily held in place and the deep and subcutaneous tissues were closed with fine formalized catgut. No splint was applied but a voluminous dressing kept the part immobilized.

The pathological report was as follows: "Tumor of thumb occupies the distal end of the middle phalanx and reaches down into the shaft for a distance of 0.5 centimetre and extends over the entire width of the bone. (Fig. 4.) It consists of soft, red tissue which is moderately firm in consistency. Microscopic sections show it to consist of large numbers of giant cells, surrounded by a fibrous tissue which is adult in type



FIG. 6.—Röntgenogram of thumb five weeks after replacement of proximal phalanx by graft from tibia. Union with the metacarpal is apparently taking place.



FIG. 7.—Röntgenogram of thumb six months after replacement of proximal phalanx by graft from tibia. New bone is of the same density as the metacarpal.

and not very cellular. (Fig. 5.) The cells are oval and quite similar to fibroblasts which are nearing maturity. On the edge are very many small spicules of bone between which is the same cellular tissue and the giant cells as in the main tumor, and this evidently represents the advancing edge of the growth. Occasionally a mitotic figure is seen, but these are not numerous enough to put the tumor into the malignant class, and the rest of the stroma does not at all suggest malignancy. Diagnosis: Giant-cell tumor of bone of thumb."

The post-operative convalescence was uneventful and the stitches were removed on the tenth day at which time the wound was completely healed. An attempt was made to get motion in the distal phalanx, starting at this time, but only a slight give was permissible. On September 20, examination showed the graft to be apparently firm and a röntgenological examination seemed to show that the bone was becoming firmly attached to the metacarpal. (Fig. 6.) In October, a leather thumb support was made in order to further protect the graft and the patient was instructed to use the thumb as freely as possible. On February 5, 1925, six months after the operation, the thumb could be used very freely, although of course the metacarpo-phalangeal joint was absent. The distal joint of the thumb had not regained any motion and the ultimate result was practically a stiff but very serviceable thumb. Röntgenograms showed the graft undoubtedly alive and growing. (Fig. 7.)

WALLACE H. COLE

Although it is too soon to state definitely the ultimate outcome in this case, it is felt that certain facts seem to be clear. Giant-cell tumors of the type here found are beyond doubt benign and curable by complete local removal, and it is therefore reasonable to expect that no further trouble will arise in this case as a result of the presence of tumor tissues itself. The bone graft is certainly alive, or at least has been replaced by live bone, for the röntgenological picture shows this fact definitely. Whether the surgical procedure in this case was that of choice is probably a debatable point, but it was certainly impossible to remove the tumor entirely by any other means than resection of the phalanx. The gap remaining might have been filled by allowing the distal phalanx to fall back against the metacarpal in a manner similar to that used by Codman in a finger, as reported by Bloodgood. The amount of soft tissue which had to eventually contract or absorb was so great, however, that this method, if used, would undoubtedly have assured a rather useless thumb. The graft from the tibia as used appeared to be the safest procedure and the functional result obtained bears out that judgment.

SUMMARY

Two cases of benign giant-cell tumor of the phalanx are reported. The first of these involved the proximal phalanx of a toe, and is cured five and one-half years after amputation. The second involved the proximal phalanx of the thumb. This patient was well sixteen months after the phalanx was resected and replaced by a bone graft from the tibia, driven into the metacarpal head. The result is a stiff, but very serviceable, thumb.

PERI-ARTERIAL SYMPATHECTOMY

REPORT OF THREE CASES IN WHICH IT FAILED

BY NATHAN WINSLOW, M.D.

OF BALTIMORE, MD.

FROM THE SURGICAL DEPARTMENT OF THE UNIVERSITY OF MARYLAND

To LERICHE belongs the credit not only of being the first to suggest, but also of being the first to apply peri-arterial sympathectomy in the treatment of the rebellious forms of tropho-neuroses. The operation is simple. It is without danger. It requires no elaborate technic and it is easy to execute. As devised by Leriche, it consists of (1) exposure of the selected artery by an appropriate route; (2) removal of $1\frac{1}{2}$ to 2 inches of the loose areolar tissue from the tunica adventitia. Step two is the essential portion of the operation and is accomplished by making encircling incisions around the vessel at the upper and lower limits of the site chosen for the denudation and by connecting these with a conveniently placed vertical incision. It is of the utmost importance that none of these cuts dip too deeply into the arterial wall, else a traumatic aneurism may result. The tissue thus outlined is now stripped off the tunica adventitia in thin slices or in a single piece, either by blunt or sharp dissection, thereby severing the sympathetic nerves lying beneath it and coursing along the artery. This break in the continuity of the peri-arterial sympathetic plexus is followed according to Leriche by a dilatation of the vascular tree distal to the decorticated area and by an increased blood supply, with a coincident improvement in the nutrition to the affected parts. It is to these effects that he ascribes the beneficial action of the operation. Up to 1921, he had performed this operation on 64 patients, for the following conditions:¹

Causalgia, 11 times; painful stumps, 2 times; post-traumatic contractures, 19 times; trophœdema, 1 time; post-traumatic oedemas, 4 times; ischæmia, 4 times; trophic slough on stump, 1 time; trophic slough after nerve section, 10 times; trophic slough of heel after medullary injury, 1 time; varicose eczema, 1 time; trophic trouble after frost-bite, 1 time; spasmodyc paralysis, 1 time; to modify tension of cerebrospinal fluid, 3 times; Jacksonian epilepsy, 2 times; goitre, 1 time; intermittent claudication, 1 time; erythromelalgia, 1 time.

In some instances he obtained remarkable successes, and on other occasions he had complete failures. The operation failed in the case of intermittent claudication; in one case of trophic trouble after frost-bite; in one case of spasmodyc paralysis, and in some cases of painful syndromes like erythromelalgia. In nine cases of causalgia after war wounds, he reports, two failures, two improvements and five excellent results. In certain painful crises preceding gangrene caused by endarteritis obliterans with or without

¹ Leriche: ANNALS OF SURGERY, Phila., 1921, vol. lxxiv, p. 385.

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intermittent claudication, it has given the same good results as in painful acroparæsthesia, consecutive to bruising of a finger, to wounds of the hand, palm, or sole of the foot. He performed it twice in Raynaud's disease, with satisfactory results. In painful stumps, it gave one success and one failure. In three cases of trophœdema, a rapid diminution of the œdema resulted. In trophic diseases leading to œdema, arterial decortication proved very efficacious; twelve out of thirteen cases were followed by rapid healing. In some cases of trophic lesions consecutive to a section of a nerve, the results were excellent. In ten such cases he obtained rapid healing of the ulcer.

Farther on in the same article, he says, the post-operative vasodilatation being lasting, peri-arterial sympathectomy can be utilized to help the insufficient circulation, for instance, in endarteritis obliterans.

The literature contains a number of papers by thoroughly competent and reliable observers extolling the virtues of arterial decompression. With the testimony of such witnesses the procedure must have a measure of value when applied to properly selected cases. The big question is, what cases may be considered as coming under this category? As yet too few adverse reports have found their way into print to serve as a starting point for the solution of this problem. The following case histories represents the experience of the surgical staff at the University of Maryland with the operation.

CASE I.—The patient, a white male, age thirty-six, entered the hospital, March 9, 1924, with a beginning gangrene of the right foot. Four years previously, he had had his left thigh amputated for thrombo-angiitis obliterans. Some six months before, he had begun to suffer with pain in his right foot. This increased gradually in severity and at times for the preceding three months had been almost unbearable. It was worse at night and exaggerated by exercise. Occasionally the foot had become greatly swollen, without apparent cause. Examination revealed a decidedly purplish mottling of the foot. When elevated the foot became pale and on lowering cyanotic. It was tender and very painful. Its anterior half was of a dusky red color, but not swollen. Passive motion increased the pain and blanched the foot; when stopped the capillaries refilled rapidly and the foot quickly assumed its erstwhile cyanotic hue. Heat or cold, when applied to the foot, caused intense pain. The diagnosis was gangrene of the toes consecutive to a thrombo-angiitis obliterans.

On March 12, 1924, the popliteal artery was exposed at its upper third and a circumferential layer of areolar tissue peeled off the tunica adventitia for a length of two inches. For a few days, it looked as though the operation had accomplished some good. The pain was less severe and the foot appeared warmer. The improvement was, however, quite fleeting; and the symptoms then returned with greater severity than ever. Fearing that the intervention had not been done at a sufficiently high level, the operation was repeated, April 15, 1924. This time the incision was made through Scarpa's triangle and the common femoral artery denuded with a technic exactly similar to that employed above, but with results equally as unsatisfactory. Owing to constantly increasing symptoms on May 10, 1924, a mid-thigh amputation was performed. The pathologist reported that specimens taken from the femoral artery showed extensive thickening of the arterial wall, thus confirming the clinical diagnosis of thrombo-angiitis obliterans. After both of these operations, the femoral and popliteal arteries contracted down to half their original size and ceased to pulsate below the site of denudation, thus conforming to the signs of a properly executed operation as laid down by Lerche.

PERI-ARTERIAL SYMPATECTOMY

CASE II.²—The patient, a white male, age thirty-eight, was admitted to the hospital, February 26, 1924, for Raynaud's disease of the left foot. In June, 1923, he had had the large and small toes of this foot amputated for gangrene. From that time he had constantly suffered with what he described as a drawing sensation in his left foot. It was constant and present both day and night, but of equal intensity. It was less noticeable when walking. The foot had periods of alternate heat and cold. The big and little toes were missing. The second toe was purplish in color. On the under surface at the extreme tip of the distal phalanx was a small opening from which an occasional drop of pus escaped. The blood Wassermann was negative. Examination of the spinal fluid gave a positive globulin reaction, a cell count of two, and a negative Wassermann. The gold curve was of normal type. The condition was diagnosed as Raynaud's disease and a peri-arterial sympatetectomy suggested.

Accordingly on March 1, 1924, a vertical incision was made in Scarpa's triangle, the common femoral artery exposed, and denuded for a distance of two inches. Here again, the artery contracted at the operative site and ceased to beat distally, indicating a properly executed technic, but no benefit followed. Therefore, on March 20, 1925, the second toe was amputated at its metatarso-phalangeal articulation, under a 2 per cent. procaine anaesthesia. A microscopical examination of sections showed necrosis of the terminal phalanx of the second toe of the left foot; the bone, connective tissue and skin all being involved in the process.

On November 4, 1924, this man was readmitted to the hospital, with an ulcer of the stomach, for which he took the Sippy treatment. In this connection, it is interesting to speculate concerning the possible bearing of the Raynaud's disease upon the appearance of the stomach lesion. Were the same forces at work in the two, or were their presence in the same case merely coincidental? Admittedly, the spasm of the duodenal vessels with the associated tissue anaemia, could readily cause metabolic disturbances of such a character as to produce an absorption of the intestinal wall. Telford and Stopford³ report a somewhat comparable case. Their patient was a man with an eleven-year history of thrombo-angiitis obliterans, who was operated on successfully for a perforated duodenal ulcer. These cases may throw some light on the factors underlying the formation of gastric and duodenal ulcers. In view of the investigations made recently by Berlet⁴ on the distribution of the arteries to the various parts of the stomach, this seems all the more probable. This author found that the course of the vessels differs at the pyloric end from the distribution on the anterior and posterior surfaces of the stomach. In the pars pylorica very delicate arterioles run parallel to its longitudinal axis and exhibit hardly any anastomoses, while elsewhere the vessels extend almost vertically over the gastric parietes and inosculate freely.

CASE III.—The patient, a white male, age sixty-four, was admitted to the hospital, May 2, 1924, for a gangrenous second toe of the left foot. About five months before, he had begun to suffer with cold and painful feet. A little later he noticed that the second toe of the left foot had commenced to turn dark. He had had much treatment, both local and constitutional, but to no avail. Examination at the time of admission showed a gangrenous second toe of the left foot and the contiguous structures were red, oedematous, and swollen as high as the ankle. No pulsation was felt in the dorsalis pedis artery, but a weak pulse was perceptible in the popliteal. The general arterial tree was moderately sclerosed. With the exception of the above findings the man was apparently healthy. The condition was diagnosed as thrombo-angiitis obliterans with

² Case also reported by Friedenwald, J., and Love, W. S., Jr. *Jour. Amer. Med. Assn.*, 1925, vol. Ixxxv, pp. 83-85, Raynaud's Disease Complicated with Gastric Ulcer.

³ Telford and Stopford: *Br. Med. Jour., Lond.*, 1924, vol. ii, p. 1035; abst. in *Surg., Gyn. and Obst.*, Chicago, 1925, vol. xl, supplement, *Internat. Abst. of Surgery*, p. 414.

⁴ Berlet: *Zeitschr. f. Pathol.*, 1924, vol. xxx, p. 472; abst. in *Surg., Gyn. and Obst.*, Chicago, 1925, vol. xl, supplement, *Internat. Abst. of Surgery*, p. 372.

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beginning gangrene of the left foot and a peri-arterial sympathectomy suggested as offering the best chance for saving the foot.

Operation—May 6, 1924, ether anaesthesia. The common femoral artery was reached by a vertical incision through Scarpa's triangle and deprived of its superficial layer of areolar tissue over a length of $1\frac{1}{2}$ inches. The vessel immediately contracted down to half its original size throughout the entire extent of its denudation and there was no visible or palpable pulsation below the operative site. No relief followed. The man complained of the pain in his foot more bitterly than ever and the gangrene continued to spread. With no appreciable evidence of relief in sight, a mid-thigh amputation was done, May 14, 1924, with complete satisfaction to the patient.

Peri-arterial sympathectomy has been performed four times on three patients at the University of Maryland, thrice for thrombo-angiitis obliterans with gangrene of the toes, and once for Raynaud's disease of the foot. Not once did the operation exert the slightest influence over the progress of the disease, all three patients having subsequently to undergo amputations. In no instance can the failure be blamed on a faulty technic; for in each case, the artery contracted down to a mere thread throughout the entire extent of the denuded area and ceased to pulsate both to sight and to touch beyond the operative site, the occurrence of which phenomena according to Leriche is proof positive that the decortication has been properly executed.

With the information in hand, nobody can forecast what the future has in store for peri-arterial sympathectomy. Its acceptance or rejection is contingent upon later developments. Therefore any facts with a bearing on the subject—be they favorable or detrimental—should be of genuine interest to the profession, especially as the methods hitherto used in combating these affections have been found wanting. From present indications peri-arterial sympathectomy is worthless in senile gangrene, in ascending neuritis, in erythromelalgia; in causalgia and in trophic ulcers the results are more favorable, but undependable. Jeanneney and Mathey-Cornat⁵ recommend it as one of the best indirect methods for securing a prompt cure of varicose ulcers, but it leaves the cause untouched, consequently recurrence is likely. On the few occasions, it has been used at the University Hospital, three times for thrombo-angiitis obliterans and once for Raynaud's disease, peri-arterial sympathectomy has been a complete failure. The natural assumption is that these diseases are also outside of the pale of peri-arterial sympathectomy.

While the series is by far too small to be staged as an infallible argument against peri-arterial sympathectomy; it should, when taken in conjunction with the research findings of Palma,⁶ be regarded as very suggestive. This investigator divided the sciatic nerve of dogs to cause trophic ulcer. Either prior to or coincidently with the neurectomy, he performed a peri-arterial sympathectomy on the corresponding femoral artery. In not a single instance did the sympathectomy hinder the appearance of the ulcer, or cause it to heal.

⁵ Jeanneney and Mathey-Cornat: *Arch. Franco-Belges de Chir.*, Brussels, 1924, vol. xxvii, p. 884; and also abst. *Jour. Amer. Med. Assn.*, Chicago, 1925, vol. lxxxiv, p. 1388.

⁶ Palma: *Ann. Ital. di chir.*, 1924, vol. iii, p. 811; also abst. *Surg., Gyn. and Obst.*, Chicago, 1925, vol. xl, supplement, *Internat. Abst. of Surg.*, p. 369.

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Want of success, Palma attributed, to a sleeve of cicatricial connective tissue forming in the arterial tract and this, in retracting, interfered with the functioning of the artery and seemed to be of importance in diminishing the amount of blood delivered to the parts lying beyond the operative site. Furthermore, Palma found that in some cases obliterating endarteritis resulted from the injury to the vessel walls; which in association with the constriction of the arterial walls by the cicatricial sleeve, he thought, was sufficient to explain the failures and the transitory effect of peri-arterial sympatetectomy.

Whether peri-arterial sympatetectomy is to survive the first wave of enthusiasm accorded it, cannot be answered at the present time. Certainly before it commands anything like popular confidence, many more examples of its successful application must have come to hand. In the meanwhile, until more case-reports are available for careful study and critical analysis, a spirit of fair-play demands that all preconceived opinions—either for or against the operation—should be held in leash.

GLOSSOPHARYNGEAL NEURALGIA AND ITS SURGICAL RELIEF*

BY ALBERT O. SINGLETON, M.D.

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THOUGH glossopharyngeal neuralgia is not nearly so common as trigeminal, it is just as definite a disease. Probably many cases pass unrecognized, because the condition is almost unknown to the medical profession. Textbooks do not mention the complaint, and a search of the literature reveals only four articles written upon this subject in American literature, and a lesser number in foreign literature.

Sicard and Robineau¹ described three cases of what was termed "Algic velopharyngee essentielle." Two of the cases occurred in the French Army in 1916-1917; the third was presented by the author. All three had typical symptoms. Harris,² in 1921, described two cases of paroxysmal neuralgia of the glossopharyngeal which is the first record I am able to find of such cases in American literature. Doyle,³ in 1922, after careful study of the subject, published a very illuminating paper reporting four cases observed in the Mayo Clinic. Lillie,⁴ in 1922, reported three cases, though they were not typical glossopharyngeal neuralgia. In 1924, Adson⁵ published an excellent treatise on the surgical treatment of glossopharyngeal neuralgia, reporting in detail four operated cases, and stating that five additional cases had been observed since Doyle's report, making in all nine cases studied at Rochester. At this time I desire to add two cases to this list, one a patient of my colleague, Doctor Thompson, and one of my own.

Because of so little publicity, the recognition of this disease is being acquired by rather bitter experience, and at the painful expense of the patients. My knowledge of this condition was arrived at accidentally, and in an interesting manner, the relating of which will illustrate the general limited knowledge of the subject.

In 1923, my colleague, Doctor Thompson, had a patient suffering with neuralgia, which was diagnosed as trigeminal. An alcohol injection of the gasserian ganglion was done. The neuralgia persisted, although the trigeminal nerve was successfully anaesthetized. The patient later went East where the posterior root of the gasserian ganglion was divided, without in the least affecting the pain. In discussing the case with Doctor Adson, he found that similar cases had been observed in Rochester, which subsequently had been found to show the typical syndrome of glossopharyngeal neuralgia. A review of the case history convinced Doctor Thompson that his case was evidently one of the same type. My first intimation of the existence of the disease dates from the interest the case aroused in us. With this knowledge fresh in mind I readily recognized the true nature of the case under my own care.

* Read before the Southern Surgical Association, December 17, 1925.

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CASE I.—(Patient of Dr. J. E. Thompson.) Unit Hist. No. 9511. An unmarried woman, forty-six years of age, who had been generally in good health all of her life. For several years she had been having attacks of pain in the right side of her face and neck which were intermittent in attacks and paroxysmal in character. The pain was chiefly present in the posterior part of the tongue on the right edge, in the tonsillar region, and in the neck deep below the angle of the jaw. It was thought to be a neuralgia of the fifth nerve. May 30, 1923, 2 c.c. of alcohol were injected into the gasserian ganglion. Complete anaesthesia of the entire distribution of the fifth nerve resulted, but the neuralgic pains continued. The patient left Galveston and later went to a very capable neurological surgeon in the East, who did a posterior root gasserian resection about December, 1924. A communication from the patient's brother, who is a physician,

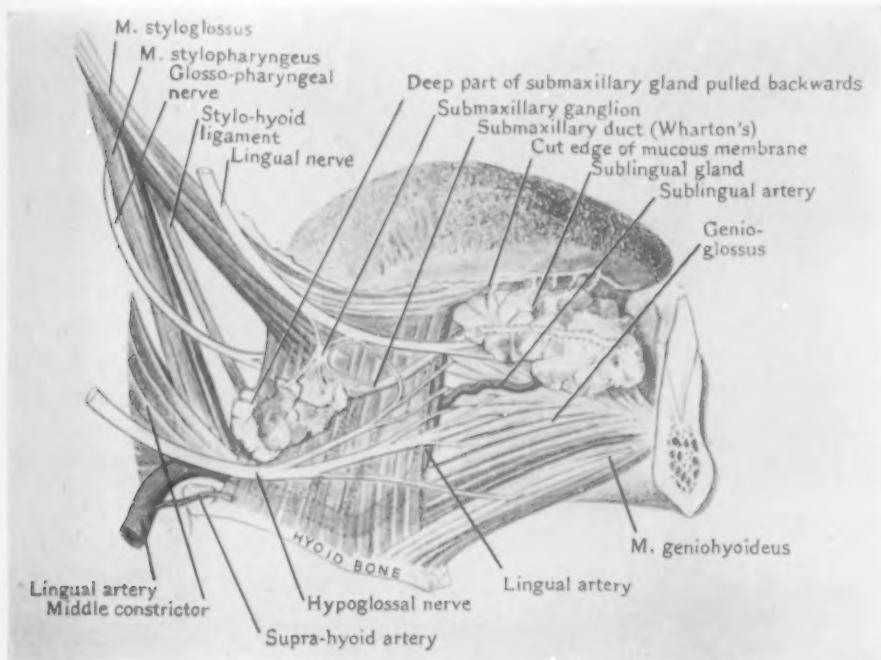


FIG. 1.—From Cunningham, showing relation of glossopharyngeal nerve to stylopharyngeus muscle.

was received several months ago. He stated that the pain had not been relieved by the operation, and that the surgeon had made a post-operative diagnosis of glossopharyngeal neuralgia.

CASE II.—Unit Hist. No. 15,610. Mrs. C. T., forty-five years of age, married and the mother of several children. She has been in good health all of her life. About two years before she began to have trouble on swallowing, which at times caused pain in her throat on the left side. After a while the pain in her neck was accompanied by pain radiating to the left ear. The attacks would leave for a little while but soon reappear, and now they have grown more and more severe. She has been to many doctors without relief. All of her teeth have been extracted in an effort to relieve the pain. For the past three or four months she has had her ear treated by an otologist, without relief of pain in the ear. She came to Galveston and consulted an otologist, who being unable to find ear or throat trouble, referred her to me, with a tentative diagnosis of trigeminal neuralgia.

Physical examination revealed a stout woman in fairly good condition, with heart and lungs normal, blood-pressure 135 over 90, and urine normal. All her teeth had been pulled, and her throat and tonsils were apparently normal. It was impossible to

make a satisfactory examination because of her intense suffering. She sat with her face in her hands, one finger of her left hand pressed over her left ear, and the fingers of her right hand pressed against the left side of her neck. Any effort at talking, or swallowing precipitated a painful spasm. She had been unable to take food or even water for two days. After being sent to the hospital and a hypodermic of morphine given, the pain became less severe and she was able to take liquid with difficulty. Pressure over the exits of the fifth nerve on the face would not start the pain, but swallowing and often talking precipitated a spasm. With the history of the first case in mind a diagnosis of glossopharyngeal neuralgia was readily made. In an effort to relieve the patient, and not being familiar with any known procedure for relief, I evulsed the glossopharyngeal nerve, June, 1925. Relief was immediately complete. The patient complained of a full

feeling in the neck and throat on the left side, but swallowing and talking were without pain. Also the pain in the ear was relieved. Relief has continued up to the present time.

The anatomy and function of the glossopharyngeal nerve has been discussed exhaustively by Adson and Doyle and their monographs should be carefully read by those interested in this subject. The glossopharyngeal nerve is a mixed nerve with both motor and sensory

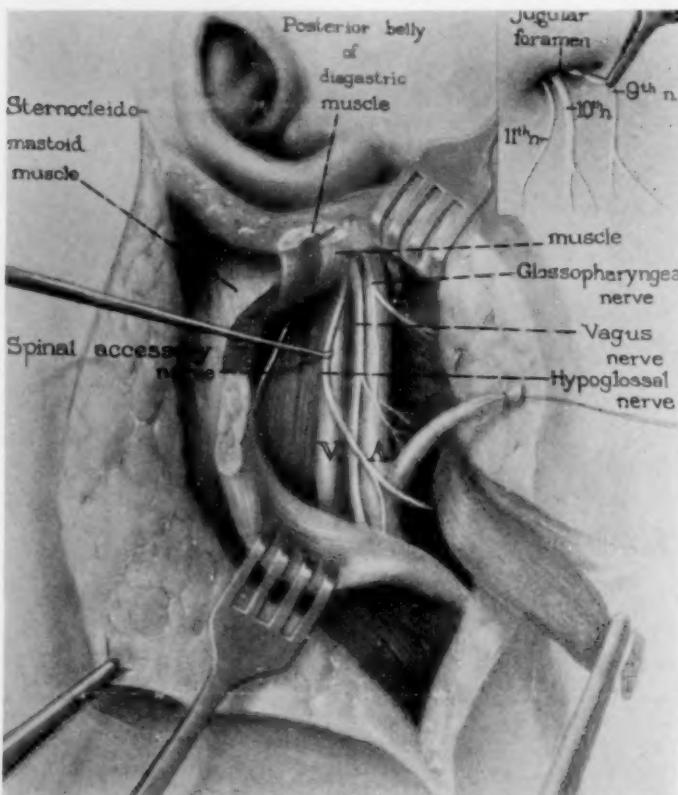


FIG. 2.—From Adson, showing relations of nerves just outside the jugular foramen and Adson's methods of avulsing glossopharyngeal nerve.

fibres, including the special sense of taste. The sensory fibres reach the mucous membrane of the middle ear, tongue, tonsillar fossæ and oral pharynx. The nerve originates in the medulla oblongata and anterior column of the cord with its superficial origin from the rostral end of the posterolateral sulcus of the medulla oblongata in a line with the tenth and eleventh nerves. It has two ganglions: the petrous and dorsal root ganglion. Leaving the skull through the jugular foramen, it passes between the internal carotid artery and the internal jugular vein, and passes behind the styloid process. At the lower border of the stylopharyngeus it turns around and runs forward superficial to

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it. It breaks up into terminal branches which ascend to palatine tonsil, posterior third of dorsum of the tongue, soft palate and glosso-epiglottic folds, and anterior aspect of the epiglottis. Before reaching the side of the tongue it supplies the stylopharyngeus and sends branches to the pharynx.⁶

The branches of the glossopharyngeal nerve are (1) tympanic, (2) pharyngeal, (3) muscular, (4) tonsillar, (5) lingual. The glossopharyngeal nerve with its branches is intimately connected with the sympathetic system, as well as contributing to the geniculate and otic ganglion through the tympanic branch. It has two larger ganglions, the petrous and dorsal root ganglion, at the lower and upper part of the jugular foramen. Since the tympanic branch, as well as other connecting branches, arise from these ganglia, it is natural to suppose that it requires the section of the nerve above these ganglia if the neuralgia is to be cured. If glossopharyngeal neuralgia is similar or analogous to trigeminal neuralgia, this would seem to be true. On this assumption, Adson has formulated an operation for exposing and resecting the glossopharyngeal nerve through an intracranial approach.

Symptoms.—Glossopharyngeal neuralgia and trigeminal neuralgia are strikingly similar as to the character of pain, and the duration and interval between attacks. But in the former the distribution of the pain is in the tonsillar region, throat and ear, with a trigger zone in the tonsillar fossa. In fact, the similarity is so striking that most cases have been treated for trigeminal neuralgia. Doctor Adson reports having divided the posterior sensory root of the gasserian ganglion in his first case. The patient not being relieved led him to further investigation, resulting in our present knowledge of the disease. Also one of the cases I am reporting had had alcoholic injections in the gasserian ganglion and subsequently a resection of the posterior sensory root of the gasserian ganglion. The attacks of pain are paroxysmal, chiefly in the region of the tonsil and pharynx, and radiating to the ear on the same side. Swallowing brings on the pain and it may be brought on by stimulating the pharynx, but not by rubbing the face over the termination of the branches of the fifth nerve. The suffering is intense. The patients are afraid to drink or eat, and become quite desperate in their suffering.

Treatment.—The injection of alcohol for glossopharyngeal neuralgia is not to be considered because of the close proximity of the vagus nerve, and large blood-vessels. Therefore, surgical procedures must be resorted to. Theoretically, and probably actually, as with trigeminal neuralgia, intracranial resection is necessary for permanent relief in most cases. The operation planned and described by Adson⁷ appears quite feasible, though as yet has not been made use of. The operation for the extra-cranial evulsion of the nerve as carried out by Adson seems to give relief over a long period of time, but according to the author it is a delicate procedure, complicated and difficult; necessitating gentle retraction of nerves. He describes the procedure as follows: "The incision was made parallel to the anterior border of the sternocleidomastoid muscle, extending upward for a distance of 2.5 cm. above the tip of the mastoid for a distance of 10 cm. On exposing the sterno-

cleidomastoid, it was found to be advantageous to divide half of its attachment on the mastoid and retract it outward, in order to obtain sufficient exposure; the dissection was then carried inward and upward behind the angle of the mandible along the skull, dividing the posterior belly of the digastric and stylohyoid muscles, gently retracting the parotid upward and outward. On retraction of the parotid, the spinal accessory was the first nerve exposed; this passes obliquely downward and outward from the jugular foramen underneath the posterior belly of the digastric. In order to obtain greater exposure, the external carotid was divided after the occipital artery had been given off, and the hypoglossal nerve, which lies superficial and lateral to the jugular

vein, was exposed. On dissecting free the jugular vein, the vagus nerve was brought into view, with a mesial pharyngeal branch which might be mistaken for the glossopharyngeal nerve. By carrying the dissection back to the jugular foramen, it can be identified as a part of the vagus nerve; carrying the dissection mesially, the internal carotid, and then the upper portion of the cervical sympathetic ganglion are encountered. After the vagus, the internal

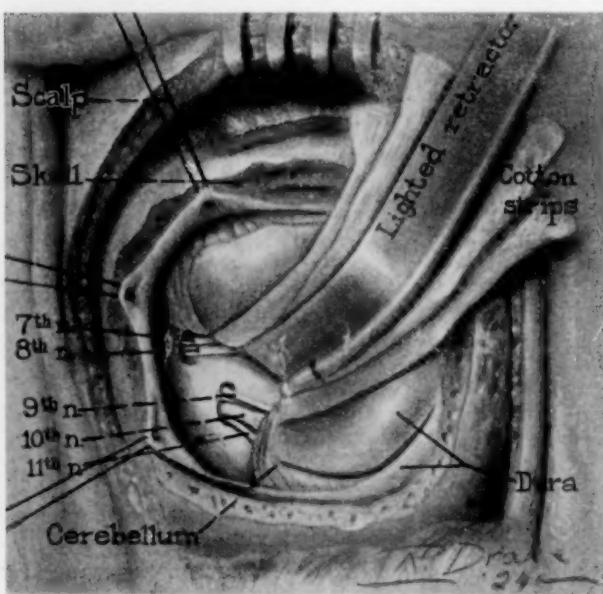


FIG. 3.—Exposure of the seventh, eighth, ninth, tenth and eleventh cranial nerves at the point of exit from the skull, preliminary to the division of the glossopharyngeal nerve. (From Adson.)

carotid, and the sympathetic nerves have been identified, the glossopharyngeal nerve will be found emerging from the jugular foramen, anterior to the tenth nerve, crossing anterior to the internal carotid, dipping beneath the styloid process, following a downward course along the posterior belly of the stylopharyngeus muscle before it disappears beneath the hyoglossus muscle."

The operation as done on my patient has not been done long enough to be a test of a cure, but it can at least be recommended for its simplicity and comparative ease of performance. Upon the cadaver, one should familiarize oneself with the relations of the nerve in order to more readily recognize it.

An incision was made along the anterior border of the sterno-mastoid muscle from the ear downward for three inches. The sterno-mastoid retracted outward and the linguo-facial vein ligated and cut, and the posterior belly of the digastric isolated. The parotid gland was pulled forward. The stylohyoid muscle with the posterior belly of digastric were retracted downward

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and backward. The external carotid artery was seen behind and above these muscles, and it was pushed backward. The stylopharyngeus muscle was seen deep beneath the angle of the jaw and above the retracted stylohyoid muscle. Along the lower and anterior border of the stylopharyngeus the glossopharyngeal nerve was seen like a white thread. It was grasped and evulsed. The wound closed without drainage.

Intracranial division of the glossopharyngeal nerve as described by Adson:⁸ "The incision is that used in performing unilateral cerebellar decompression; it is carried from the spine of the atlas upward to the external occipital protuberance; then, in the form of a horseshoe, it is carried up to the lateral sinus and down over the mastoid to its tip; the skin and muscles are reflected in the same manner as they are reflected for cerebellar decompression, and the bone is removed upward and laterally, exposing the lateral and the sigmoid sinuses. The

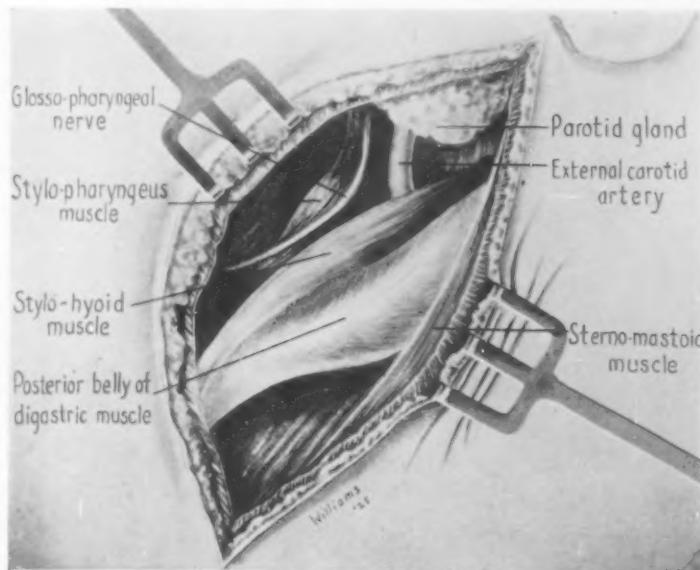


FIG. 4.—Showing relations of glossopharyngeal nerve and stylopharyngeus muscle to stylo-hyoid muscle and external carotid artery—a simple approach for peripheral avulsion.

bone is removed mesially and downward until the external occipital crest, the posterior condyloid foramen and the margin of the foramen magnum are approached; the dura is then incised and reflected mesially with a basal flap along the crest of the occipital bone. If the cerebellar lobe does not displace easily, one can either drain the posterior cistern or the posterior horn of the lateral ventricle through a separate incision above the lateral sinus. Before elevating or displacing the cerebellar lobe, it is well to cover the cortex with strips of cotton; then with the illuminated retractor elevate the lateral lobe of the cerebellum, when the seventh and eighth cranial nerves can readily be seen entering the internal auditory meatus. Inferior to these nerves and slightly more superficial, one will observe the ninth, tenth and eleventh nerves entering the jugular foramen; on closer observation, the ninth and tenth nerves are found to be short and to pass at almost right angles from the medulla, while the spinal accessory is longer

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and enters the foramen in an oblique course. Further, it will be seen that the glossopharyngeal enters the foramen at the upper portion, and is separated from the vagus by a small dural band which is less than 1 mm. in width, but definite enough to permit one to pass a small right angle ganglion knife between the fibres of the vagus and glossopharyngeal nerves, thus facilitating a sharp section of the glossopharyngeal nerve."

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QUESTIONS INVOLVED IN OPERATIVE PROCEDURES IN CASES OF GASTRIC AND DUODENAL ULCERS*

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NO OTHER problem in medicine is in a more unsettled state or attended with more conflicting opinions and results than the treatment of gastro-duodenal ulcers. The methods and results of recognized clinics in one part of this country are in direct contradiction to the methods and results of recognized clinics in another part of this country, each of these having equally efficient surgical technicians, with equally trustworthy, scientific surgical writers.

An air of conservatism prevails on this side of the Atlantic, and largely in England, that has been entirely discarded in some of the ablest clinics here and on the Continent. While such a conflicting status prevails and continues, it is obvious that the question of gastroduodenal surgery must remain submerged in doubt and indecision. It is impossible for both the conservative and the radical group to be in the right. There must be an error somewhere and one of the two groups must, if not entirely, at least in the main, be in the wrong.

One sees a large clinic claiming to cure, at least, ninety-five per cent. of duodenal ulcers by a gastro-enterostomy, and, when necessary, combined with excision, with a mortality of one to two per cent.; and gastric ulcers if combined with cautery or knife excision ninety per cent. with a mortality of two to three per cent., the result being well nigh one hundred per cent. cures.

Compare this with other clinics with equally able operators who have abandoned gastro-enterostomy as a routine operation because, as they frankly state, they are unable to obtain anything near such results—it is time that we "slack up a bit" and do a little hard thinking.

One would hardly expect a normal human being to select the more difficult method of resection in preference to the easier method of gastro-enterostomy if the same, or about the same, results could be obtained by the easier method. Many still remain to be convinced that ninety or ninety-five per cent. of gastric and duodenal ulcers can be cured in a manner that they will remain cured and not in a short time thereafter revert to the internist or undergo other operations in the hands of other surgeons. In view of this, would it be unreasonable for one to suspect that gastro-enterostomy has achieved its immense popularity because of the comparative ease of its performance? Broadly speaking, in the past and mainly in the present, it has been and is still largely hailed as a "cure all" for all surgical conditions of the gastro-duodenal region. This popularity we believe is beginning to recede to within

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its normal limits. Should its popularity be based upon its ease of performance its foundation is an unsound one. Should it become necessary for the more difficult operation of resection to supplant the easier gastro-enterostomy, it would behoove us to develop our technical ability until we are able to do resections with as low or about as low a mortality as a gastro-enterostomy. Such has been the procedure of some of the best gastro-intestinal surgeons upon the continent, and is beginning to be adopted by an increasing number of American surgeons.

The alluring claims for gastro-enterostomy are not only suspected by many, but are openly disputed by able gastro-enterologists. The results of a well-known eastern clinic where gastro-enterostomy as a routine has been supplanted by resection is: "A perfect cure in nearly fifty per cent., (47) of our cases, to this may be added a small group (19), with fair results." This same clinic was also influenced in abandoning gastro-enterostomy because of the disastrous gastrojejunal ulcers that attend gastro-enterostomy and that are absent in properly performed resections. This complication is usually more formidable than the original complaint for which the gastro-enterostomy was performed. In one series of cases reexamined in this clinic after a duration of four to nine years, thirty-four per cent. suffered from gastrojejunal ulcers of which, eighteen per cent. were reoperated upon and in sixteen per cent. the diagnosis was based upon clinical symptoms and X-ray findings.

There is also a conflict of opinions as to the underlying method through which the result claimed is obtained, namely, Moynihan, Deaver, and others, claim that gastro-enterostomy is purely a drainage operation and functionates upon a mechanical basis as drainage. According to Cannon, peristaltic pressure and fluidity is greatest at the pylorus whether there is a stoma or not, and especially, when the stomach is distended does the food prefer the pylorus to the stoma. Paterson disregards the drainage element entirely and claims the result through a reduction of the gastric acidity—a purely chemical basis.

Although ulcers may exist in the presence of a low gastric acidity, or absent in a high gastric acidity, it is generally conceded that the gastric acidity is the key to the problem. A properly reduced acidity means a cured patient. It is upon the question of acidity that the controversy mainly or entirely hinges. Those who favor the more radical procedure of resection have been charged with doing too great and an unjustified amount of surgery for the size of the lesion involved. This charge is hardly a fair one since the gastric resection is not based upon the size of the lesion but upon the underlying chemical condition that is supposed to be responsible for the lesion.

The acid cells are in the cardiac end and the hormone that regulates the activity of these cells is in the pyloric end. Their conclusion is that through the removal of the hormone, through resection the activity of the acid cells is regulated in proportion to the extent of the gastric resection. There is a reduction of the acidity upon which the cure is based and upon which the absence of the undesirable gastrojejunal ulcers rest. To this there are some

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rare exceptions as there are to all rules, but with the reduction of one-half of the pyloric end or more there is a dependable reduction of the acidity as claimed by the protagonists of this method and a completeness and permanence of the cure.

It is not the province of this paper to under-rate the value of a gastro-enterostomy if confined to its proper limitations. As a drainage procedure to pyloric obstruction it is invaluable. But, its indiscriminate application is to a great degree bringing it into disrepute. Quoting from Bastedo's paper:

"Of 261 ulcer cases returning for treatment after operation Smithies found that gastro-enterostomy had been done in all. Of six thousand, four hundred and two operations of all types for benign ulcer of the gastroduodenal area done at the Mayo Clinic, Eusterman reports that 4793 were posterior gastro-enterostomies."

"In 1921, Babcock said, 'Gastro-enterostomy is perhaps a makeshift which is better for duodenal than gastric ulcer,' and at the 1922 meeting of the American Surgical Association, Crile's opinion was that 'to do a gastro-enterostomy is just as much a confession of failure as to amputate a limb,' that is, it is a failure to restore the part physiologically. In similar tenor, Bland-Sutton (1916) placed it in "the class of operations of despair."

Much has been said of gastro-enterostomy as a drainage operation whereas, it is only a drainage operation provided the pylorus is closed or the stoma is unusually large, otherwise, the gastric contents are "swished" past the stoma, especially when the stomach is distended, in accordance with the well-recognized law of onward peristalsis. The peristaltic rest and the relief from irritation to the antrum and pylorus through peristalsis and pressure of which so much in favor of gastro-enterostomy has been said, after all, usually fails to take place. Lastly, an acid juice which in part or entirely was believed to be responsible for the duodenal ulcer is poured into the jejunum which is less able to receive it than the duodenum, and hence we have marginal and peptic ulcers of the jejunum with their attending fistulæ that were unknown before the era of gastro-enterostomy, and that represent a more formidable condition than the original one, for which the operation was performed.

The mortality of the exponents of resection as a substitute for gastro-enterostomy are fairly represented by those of Moynihan, Haberer, Finsterer, and perhaps others, to two to three per cent., not more than from gastro-enterostomy.

It is proper, however, to emphasize the fact that such a mortality only prevails in the hands of expert operators. In the hands of those not specially trained the mortality is doubtless a high one. This, however, does not justify us in performing an improper operation that happens to harmonize with our limited ability rather than it befits the demands of the pathology involved. It is not unlike the past history in neurologic surgery where the operative mortality of gasserection, which is the only permanent cure for a trifacial neuralgia was a prohibitive one until operators specialized thereon overcoming the difficulty and thus reducing this prohibitive mortality to a reasonable level. It would seem that our aim should be to acquire through experimental work,

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observation and study an increased efficiency that would enable the operator to carry out the proper procedure with a proper mortality.

As gastric ulcers remaining or developing after a gastro-enterostomy may undergo cancerous degeneration, the resection offers a more reliable safeguard against such a danger than a mere gastro-enterostomy.

Lewisohn says: "It is, indeed, very interesting that support in favor of resection comes from the internist. Many physicians who had occasion to compare the permanent cures following resection of the stomach with the many failures following simple gastro-enterostomy are strong supporters of the resection.

"It is generally assumed that the incidents of gastrojejunal ulcers following gastro-enterostomy is about five per cent. However, if we analyze statistics dealing with the late results following gastro-enterostomy we find that this figure is not based on definite data. Many authors are not able to say positively what happened to their patients after an interval of some years. They consider only the few patients who come back to their Clinic for re-operation."

Aside from gastro-enterostomy and resection we have the Finney and the Horsley operation, as eligible procedures for duodenal ulcers. The underlying principles of each are about the same, namely, relieving the pyloric end of muscular activity and irritation through a better outlet for the gastric contents. Thus setting at rest and relieving the peristaltic pressure. In these the anatomy and physiology of the stomach does not undergo the same degree of change as in either of the other operations. Where the ulcers are adherent or the mobility interfered with, these procedures which otherwise possess distinct advantages may become more difficult or undesirable by reason of such limited mobility.

In conclusion there should be emphasized the unsettled state of many questions bearing upon gastroduodenal ulcers, such as their origin, many of their clinical phases and, lastly, their proper classification with reference to treatment, medical or surgical, and if surgical, the type of operation best suited to the case involved.

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THE HEALING OF THE GASTRIC ULCER IN MAN*

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FROM THE SECTION ON SURGICAL PATHOLOGY OF THE MAYO CLINIC

AN ADEQUATE description of intermediate stages in the healing of gastric ulcer in man is not available, although certain phases in the developmental history of such ulcers have been known for a long time. The first stage is probably the acute hemorrhage in the mucosa and submucosa which grossly may be only a red spot with a slight break of the glistening membrane. Microscopically there is a defect in the epithelium with free blood in the excavation and adjacent tissues. This early ulcer is usually cone-shaped, the apex of the cone being towards the muscularis, and the base at the lumen of the stomach. The second well-known picture is the chronic U-shaped gastric ulcer. The gross appearance of this lesion is common knowledge. The walls of the ulcer

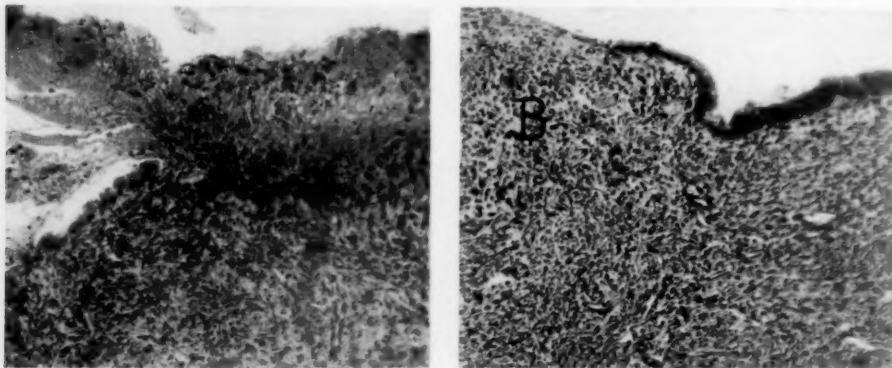


FIG. 1.—Peptic ulcer produced experimentally, illustrating the organizing blood clot in the ulcer cleft (a) and the mushroom-shaped granulation tissue (b) developed in the base of the defect with cuboid epithelium growing from the margin to cover the "plug." This ulcer was protected from the gastric contents for five days. (Published through the courtesy of Dr. F. C. Mann and the Saunders Company, from *Surgical Clinics of North America*, 1925, v. p. 766.) (x 100.)

are composed of fibrous connective tissue infiltrated with lymphocytes, plasma cells, leucocytes and mast cells. There is connective tissue in the base of the defect and occasionally an organizing fibrinous exudate, granulation tissue, and necrotic material.² Blood-vessels in the deeper tissues of the wall opposite the defect may be thrombosed or contain canalized thrombi. At the edges of the ulcer the epithelial cells flatten and attempt to cover the denuded area.^{2, 3, 6, 9, 10} In the final stage, after the gastric ulcer is healed, there is a pale pink to gray scar covered by mucous membrane. The epithelium topping the scar is a thin layer of cuboidal to columnar cells. Just beneath this layer are deformed cystic glands,⁷ and surrounding these fibrous, connective tissue infiltrated with inflammatory cells.⁶ The muscularis is replaced by fibrous tissue.

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The whole life cycle of experimentally produced peptic ulcer in animals has been thoroughly studied by Mann and his co-workers,^{11, 12, 13} from the first break of the mucosa with hemorrhage and destruction of the epithelium to the covering of the scar-filled defect. One of Mann's original contributions to our knowledge of the healing of peptic ulcers was his observation that following protection of the lesion from the gastric contents the hemorrhage in the ulcer became organized and a granulation-tissue "mushroom," containing inflammatory cells and very rich in blood-vessels, grew from the base of the lesion into the organizing blood clot in the cavity of the ulcer. On this framework the epithelial cells grew out as a single flat layer from the edges of the crater up the stalk of the mushroom and over the top until the granulation tissue was covered by mucosa (Fig. 1). Finally atypical crypts developed on the surface and cystic glands in the deeper layers of the mucosa. In experimentally produced ulcers of the most chronic perforating type, healing processes were constantly taking place. Epithelial cells were continually attempting to grow from the edges of the ulcer across the base. Granulation tissue was persistently attempting to form in the cavity of the ulcer.

Mann has observed a single layer of epithelium trying to bridge a perforated peptic ulcer that was closed only by omentum.¹⁴ Epithelial cells apparently creep out in this insecure position only to be swept off and destroyed. Experimentally produced ulcers did not heal unless granulation tissue grew from the base of the ulcer as a bed for the oncoming mucosa.¹⁴ There was an incessant battle between the forces of repair and destruction.

Kennedy has recently described duodenal ulcer found in a child dying of melena neonatorum which had all essential features of healing noted in experimentally produced peptic ulcers.



FIG. 2.—Duodenal ulcer with organizing fibrinous exudate in the base. (x 27.)



FIG. 3.—Gross appearance of the gastric ulcer with granulation tissue in the base at (A).

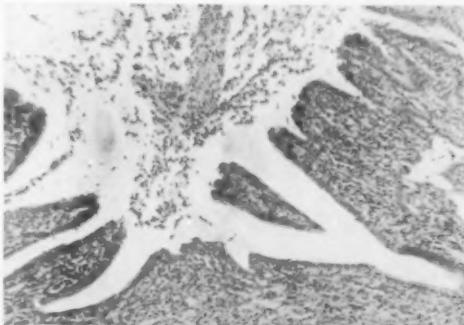


FIG. 4.—Flattened epithelium covering the plug of granulation tissue in the edges of the ulcer. (x 50.)

In the following case a gastric ulcer removed at operation was studied. This lesion exhibited the reparative changes described by Mann in his experimentally produced ulcers.

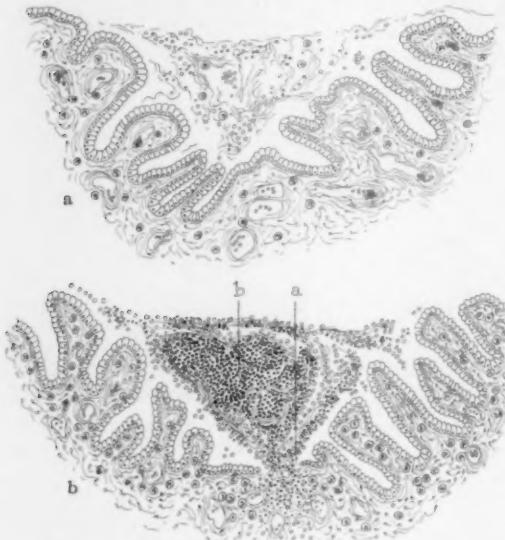


FIG. 5.—Diagrammatic sketches illustrating the stages in the healing of gastric ulcer. Sketch (a), healed edge of the ulcer. Sketch (b), break of the mucosa of the base of the ulcer (a) with an organizing blood clot in the defect (b).

Exertion caused dyspnoea and palpitation. The patient was a poorly nourished young man 5 feet 9 inches tall, weighing 129 pounds. Oral examination revealed periapical infection of the teeth 3, and infection of the tonsils 2. There were tenderness and increased resistance in the epigastrium. Two hundred seventy cubic centimetres of a test-meal was recovered one hour after administration. Analysis of this meal revealed a free acidity of 20 and a total acidity of 44. Haemoglobin was 78 per cent.; the erythrocytes numbered 4,450,000, and the leucocytes 7800. Examination of the urine was negative. The Röntgen-ray diagnosis was ulcer at the pylorus, with retention 2. The patient was transferred to the hospital and given a "retention diet," which consisted of milk, custards, cereals and eggs in small feedings every two hours. On two successive days the stomach was lavaged and no retention noted. At operation one ulcer was found in the stomach and one in the duodenum. The duodenum was opened and the duodenal ulcer excised, then the incision was carried up into the stomach and the gastric ulcer removed. The closure was made as a gastroduodenostomy. The

A man, aged thirty-two, had complained of indigestion for four years. He had had typhoid fever in 1916. A gonorrhoeal infection was admitted. Otherwise his health had always been good. He drank coffee once a day and smoked a pipe moderately. The present illness began as an intermittent epigastric distress coming on from two to three hours after meals. The pain was described as a "sore ache." It did not radiate and was not relieved by soda, but was eased by taking more food. He was frequently distressed with gas. When the epigastric discomfort came on the patient was nauseated. Vomiting always relieved the distress. All raw fruits or acid drinks that were taken were vomited immediately. In the last month he had lost weight (12 pounds), strength, and appetite.

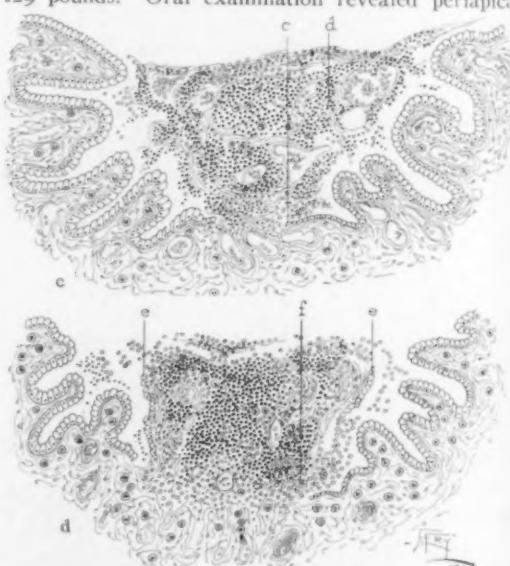


FIG. 5.—Sketch (c), Flattened epithelium growing in from the edge of the ulcer (c) with formation of a mushroom of granulation tissue in the defect of the mucosa (d). Sketch (d), cuboidal epithelium attempting to cover the plateau of granulation tissue in the ulcer (e). Recent hemorrhage (f) with a break of the epithelium covering the base of the ulcer.

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appendix was also removed. The gastric ulcer was 3 mm. in diameter, and the duodenal ulcer 6 by 3 by 1 mm. The pathologic report regarding the appendix was chronic catarrhal appendicitis. Fifteen days after operation the patient was dismissed from the hospital in good condition.

There was an organizing fibrinous exudate in the base of the duodenal ulcer.

At the edges of the cavity the epithelial cells were flattened and apparently attempting to grow down and cover the excavation (Fig. 2). The gastric ulcer revealed unusual changes; in the base of the cavity and almost filling it was a raised gray to pink area (Fig. 3). This ulcer was put into 10 per cent. formalin immediately after being photographed, and serial sections were cut later. Preparations from the margin of the excavation contained a raised "plateau" or "mushroom" of

FIG. 6.—Ulcer with blood clot in the defect. The fibrosis of the base of the ulcer and the break of the mucosa are revealed. (x 22.)

granulation tissue covered by a single layer of flattened gastric epithelium (Figs. 4 and 5a). Nearer the centre of the ulcer there was a definite break in the mucosa with an organizing hemorrhage in the ulcer cavity (Figs. 5b, 6, and 7). Continuing toward the centre of the ulcer more advanced organization of the blood clot was revealed with development of blood vessels in the clot and tissue adjacent in the base of the ulcer. A definite plateau had developed in the ulcer as described by Mann. In some areas the epithelium at the margin of the defect had lost its columnar character, become cuboidal and apparently grown out on this granulation-tissue bed and up the sides of the mushroom (Figs. 5c and d, 8, and 9). There were many concentric organizing hemorrhages in some regions of the ulcer. At one place in the ulcer cavity there was free blood with an abrupt fault of the epithelium and tearing loose of granulation tissue (Figs. 5d and 10). Gram stains of sections of tissue from the ulcer made

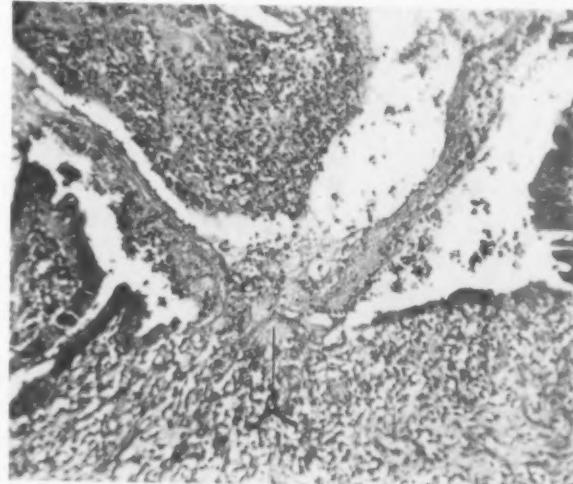
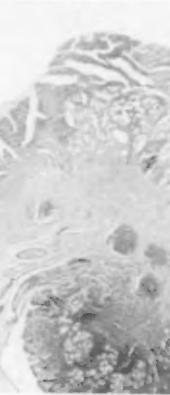


FIG. 7.—Break in the mucosa (a) with organizing hemorrhage in the defect. (x 60.)

according to Rosenow's technic revealed many Gram-positive diplococci in the deeper granulations of the ulcer. Distant from the ulcer no organisms were

found except on the surface of the mucosa. Rosenow¹⁶ and others^{4, 5, 8, 15} have observed morphologically similar organisms in peptic ulcers of man (Fig. 11).

Discussion.—

This unprotected peptic ulcer illustrates the constant struggle between the healing and ulcerative forces. Notwithstanding

FIG. 8.—Flattened epithelium at (a) growing from edges of the ulcer on the granulation tissue in the base of the defect. (x 120.)

the probable constant activity of traumatic agents (mechanical, chemical, bacterial) granulation tissue formed in the base of the ulcer and epithelium grew out on this scaffold. Our observations coincide with those of Crohn, that peptic ulcers are constantly attempting to heal. Slight trauma to the epithelium growing out to bridge the fault frequently causes hemorrhage and arrested healing, as was illustrated in certain areas of this ulcer (Fig. 10). Partial dislodging of the granulation-tissue plug in an ulcer causes bleeding. This probably occurs frequently. It may explain the paradox occasionally encountered of a patient with symptoms of a bleeding peptic ulcer in whom at operation a few weeks later no ulcer can be visualized, the ulcer probably having healed in the interim of beginning symptoms and operation.

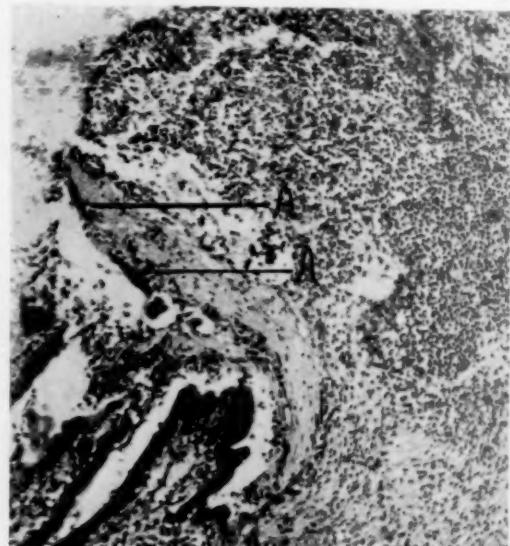


FIG. 9.—Epithelium along edges of mushroom of granulation tissue at (a). (x 80.)

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The granulation tissue bud in the base of the ulcer was a very important factor in healing. Mann¹⁴ has always found this peculiar formation in every

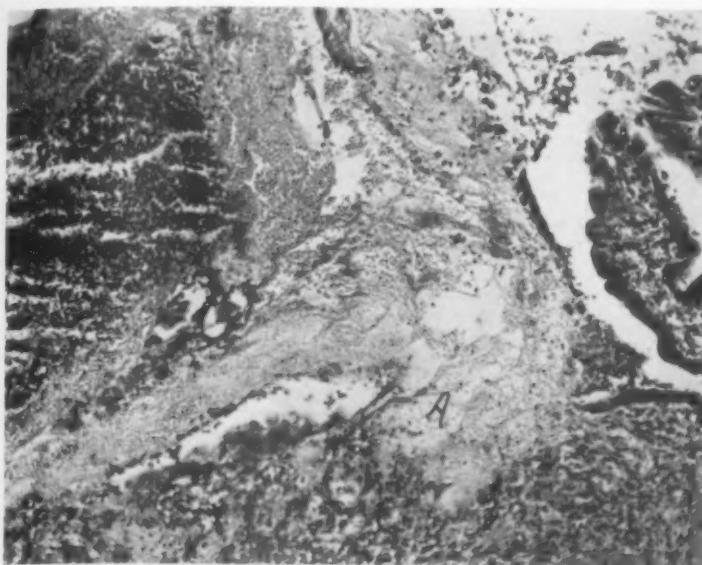


FIG. 10.—Fresh hemorrhage at (a) with a sharp break in flattened epithelium, and loosening of granulation tissue. (x 100.)

experimental peptic ulcer that was healed or partially healed. Kennedy described such a plug in his case and the case reported here exhibited this structure. It is possible that chronic gastric ulcers continue unhealed, enlarge concentrically, and become perforated be-

cause they cannot produce this element. The dense fibrosis of the walls and base of chronic peptic ulcers with the accompanying reduced blood supply may be a factor in inhibiting the formation of granulation tissue. This influence of poor blood supply on healing is well illustrated in Röntgen-ray burns with their marked vascular changes. Small ulcers with overhanging borders, which protect the granulations in the base, apparently heal much more readily than large callus peptic ulcers. If granulation tissue does form in the centre of a large ulcer its position is so precarious that it may be soon dislodged. The healed ulcer with its thin layer of epithelium and irregular glands is a place of low resistance and easily breaks down and ulcerates again.^{1, 2}

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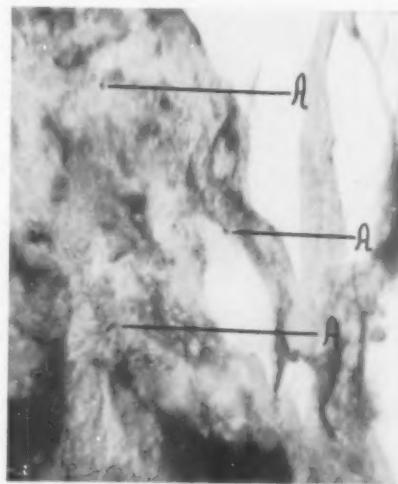


FIG. 11.—Gram-positive diplococci in the granulation tissue in the base of the ulcer at (a). (x 400.)

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CARCINOMA OF THE RIGHT SEGMENT OF THE COLON*

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WHILE there are several chronic diseases more destructive to life than cancer none is more feared. The fact that death from cancer is on the increase is not only an added problem of medicine, but it at the same time testifies to the wonderful efficiency of medical science in the prevention and cure of most of the destructive diseases, and in increasing the average age of man. This postponing of death enables more persons to live long enough to develop some kind of cancer in old and less resistant tissues.

On account of the great interest manifested by the public in cancer (and, in fact, in everything pertaining to the subject of disease and health) diagnosis is made earlier and operations are consequently more successful on external cancers than can be observed or felt by the physician or the patient himself. This shows the advantage of the public discussions on cancer, cancer-week talks, and the effectiveness of newspapers in aiding in this work of education.

It is stated that there are more than 3000 cures for cancer now on record and new ones (or old ones revived) are being constantly advocated.

* Presented before the Southern Surgical Association, December 15, 1925.



FIG. 1.—Carcinoma of the cæcum.

What is most desired is first a diagnostic blood test for the disease and then a curative treatment which, to be worthy of consideration, must be equally effective for both internal and external cancer.

That a remedy will be developed with more knowledge of cancer is believed by most who have some appreciation of the history of medicine. In pathology the greatest advance was that made by Virchow in the cellular theory. The abnormal changes in the function, growth and arrangement of cells constituting a cancer have been well described by many. The clinical

experience in cancer at the clinic has been greatly aided by the observations of the pathologists, that is, in the studies on cancer, the changes in the cells, and the development of defensive tissue with its effect on a cancer cell. All have been viewed with reference to the progress of the patient over a period of years, with or without operative or other treatment. This is the basis for the real constructive knowledge which can stand the destructive criticism of pathologists trained in the study of embalmed tissues and not in pathology of unchanged frozen tissue. The work of MacCarty and Broders on the morphology and differentiation of malignant cells and the relation of these to classification, diagnosis, and



FIG. 2.—Anatomic relation of cæcum, ascending colon and hepatic flexure.

prognosis has done more to clarify the cancer question and establish rational treatment than any contribution since Virchow's classic lectures on cellular pathology. With tissue from the tumor a pathologist thus trained, when furnished with the data secured by the surgeon at operation for the removal of a section, or radical, or palliative operation, will make a most accurate prognosis on the probability of cure or the length of life of the individual with any particular form of cancer.

The surgical treatment of cancer is now much more effective than it was twenty years ago; the operations are much more thorough; and fixed and locally advanced growths involving the primary and secondary lymphatics, and those with contact growths or metastasis are treated by radiation or other

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non-surgical measures, and thus reduce the unnecessary surgical mortality. Moreover, such cancers as commonly metastasize in bone or in the lungs are not operated on without careful physical and röntgenographic examination, and surgery is thus spared the blame for many of the early deaths and so-called recurrences that used to be all too common after operations of greater than ordinary risk.

In considering special areas affected by malignant neoplasm, the surgeon must constantly study the operative risks and primary and late results, and investigate those methods which are attended by the least risk or most satisfactory results. There are often several factors which may influence the surgeon, but the essential ones are low mortality, increased comfort and satisfactory late results. In the alimentary tract cancer has a predilection for areas where the tissue cells normally change or in areas subject to traumatic or irritative cellular change, in natural or unnatural flexion angles and areas of spastic contraction with or without diverticula of the colon.

The Röntgen-ray is now indispensable in the accurate diagnosis and location of neoplasm of the alimentary tract. In a large percentage of cases carcinoma of the large bowel is seen late; this is probably more true of the right segment of the colon with its liquid contents, than of the left and lower segments of the colon in which the faeces are more solid. Blood-stained mucus or stool is less commonly noticed than in cases of tumor of the left or lower segments in which fecal traumatism is more likely. Pain is seldom a factor of importance before the onset of partial obstruction; tumor may be felt, but gases and general distention of the abdomen, or natural fat may obscure even a large tumor until late. The same kind of cellular change causing adenocarcinoma or squamous-cell carcinoma (the cause of which is yet unknown) may produce two carcinomatous areas at the same time at widely separated areas in the large bowel. In a recent case of resection

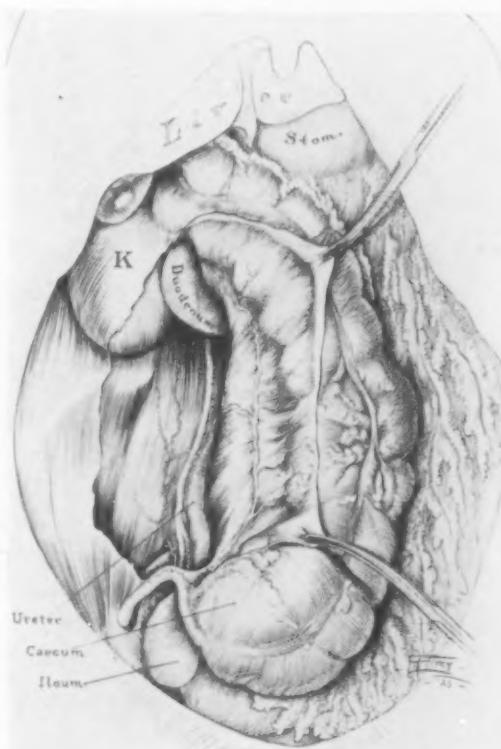


FIG. 3.—Incision through right leaf of the mesentery for reflection of right segment of the colon. Relations to duodenum, right kidney and ureter are shown.

of the sigmoid for carcinoma followed by death, it was shown at necropsy that of three mucous polyps in the cæcum, all too small to feel through the bowel, one was carcinomatous and similar to the growth in the sigmoid. The obstruction occurs earlier when the area of the ileoæcal valve is involved in the disease; such growths greatly shorten the bowel locally. They are situated in the cæcum, the cæcum and ascending colon, in the ascending colon, or alone in the hepatic flexure (Fig. 1). In the last case they may also encroach on the transverse colon. We believe in removal of the right segment of the colon

with a few inches of the ileum for carcinoma at any point from the ileoæcal coil to the hepatic flexure (Fig. 2). While the areas involved are specified in the individual record they are classified together for operative treatment. Since the return blood from this area drains through the portal veins into the liver it would seem that that organ would be early affected by metastasis, but filtration is so perfect around this sewer that carcinoma cells are not passed into the portal veins, and the liver is involved later than in cases of carcinoma of the left and lower segments, where, apparently at an earlier period, the traumatism of the carcinoma by hard faæces plays a greater part in its dissemination, in lymphatic metastasis, and the formation

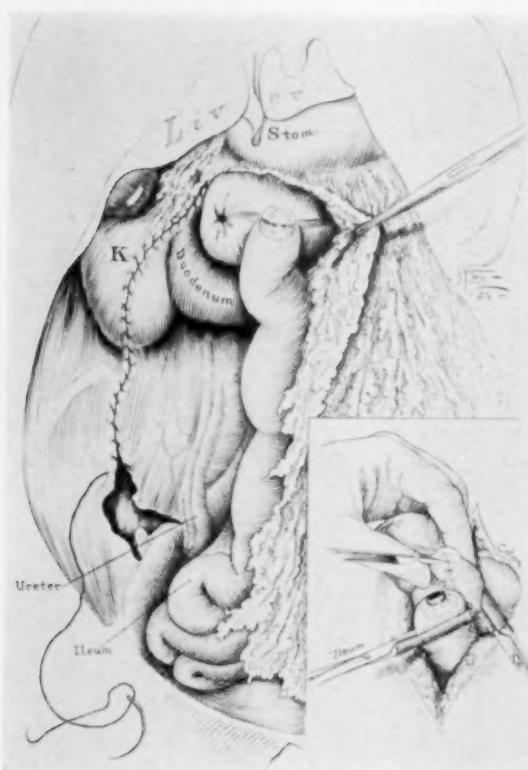


FIG. 4.—Resection and anastomosis complete (Murphy button type); parietal peritoneum closed.

of adhesions. Carcinoma of the small bowel early involves the lymph-nodes on account of the lacteal and lymphatic absorption.

Nature placed but few lymph-nodes along the colonic sewage system, and even these may be enlarged by inflammatory change in the presence of an ulcerated carcinoma. Therefore it must not be taken for granted that the enlarged nodes are cancerous, especially those of the mesentery of the ileoæcal coil which are more often inflammatory. Since the cæcum and ascending colon originate embryologically on the left side of the abdomen and pass upward across to the right and down to the iliac fossa, it is clear that all of the tissues of importance, the nerves and vessels, are necessarily on the inner half of the colonic mesentery, the outer one merely being for support

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and fixation. In operations on the right segment of the colon the division of the peritoneum should be made on the white line of attachment of the outer mesenteric leaf to the parietal peritoneum. This immediately permits the colon to swing out of the abdomen and the operative work is greatly simplified. (Fig. 3.)

If the bowel in the area of the tumor is movable a radical operation is advisable. The ileocecal coil and right segment of the colon are best removed and the ileum united to the transverse colon. (Fig. 4.) As this is a neces-

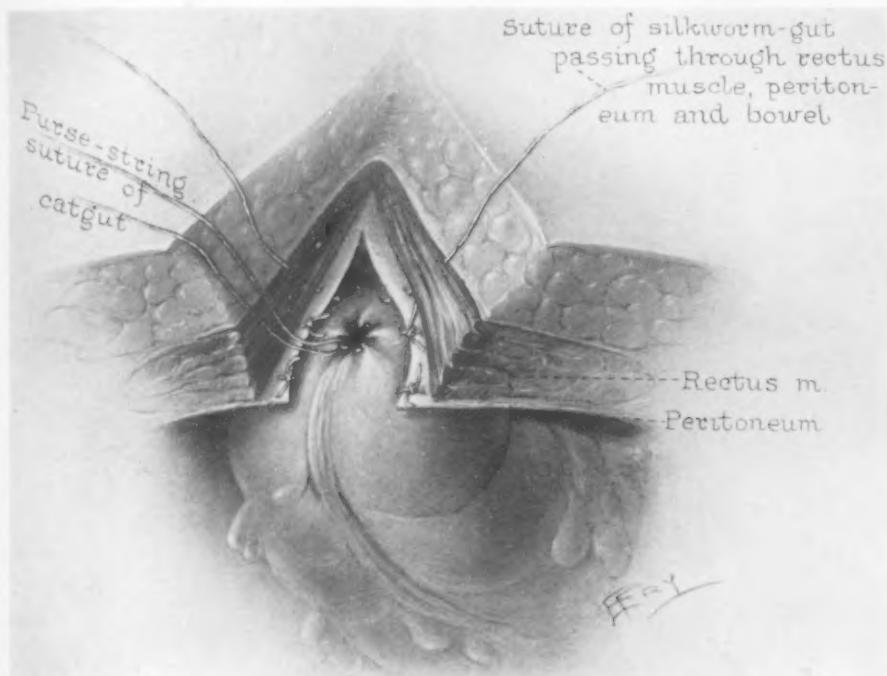


FIG. 5.—Fixation of stump of colon to parietal peritoneum at site of incision, the purse-string suture being left hanging.

sary part of the operation, the ileocolostomy may be made as the first portion of a two-stage operation when the operative risk is high. At a later period resection is carried out, and both small and large bowels divided and closed to the right of the anastomosis. In such cases small enemas and a rectal tube usually relieve the danger of gas tension on the suture line at the anastomosis. In most cases the operation is completed at one period. In such cases of the end-to-end, or side-to-side, or end-to-side methods of anastomosis, we prefer an end-to-side union of ileum to transverse colon. Here is an ideal situation for the Murphy button. The ileum is divided first and the small half of the button placed in its end; on division of the colon, the larger end is inserted loose in its lumen, and the end of the bowel closed, the button manipulated to press its anastomosing tube against the side of bowel through which an opening is then made into the tube. The tubular part is pushed

through the bowel wall and united with its other half in the ileum. Some surgeons relieve gas tension by inserting a catheter into the bowel (Witzel method). If this is done at the time of operation or later as required, and the catheter passed through the omentum and a stab puncture of the abdomen, the final withdrawal of the drain causes no fistula. As paresis and gas tension are manifested in approximately only one case in five, it is best to incor-

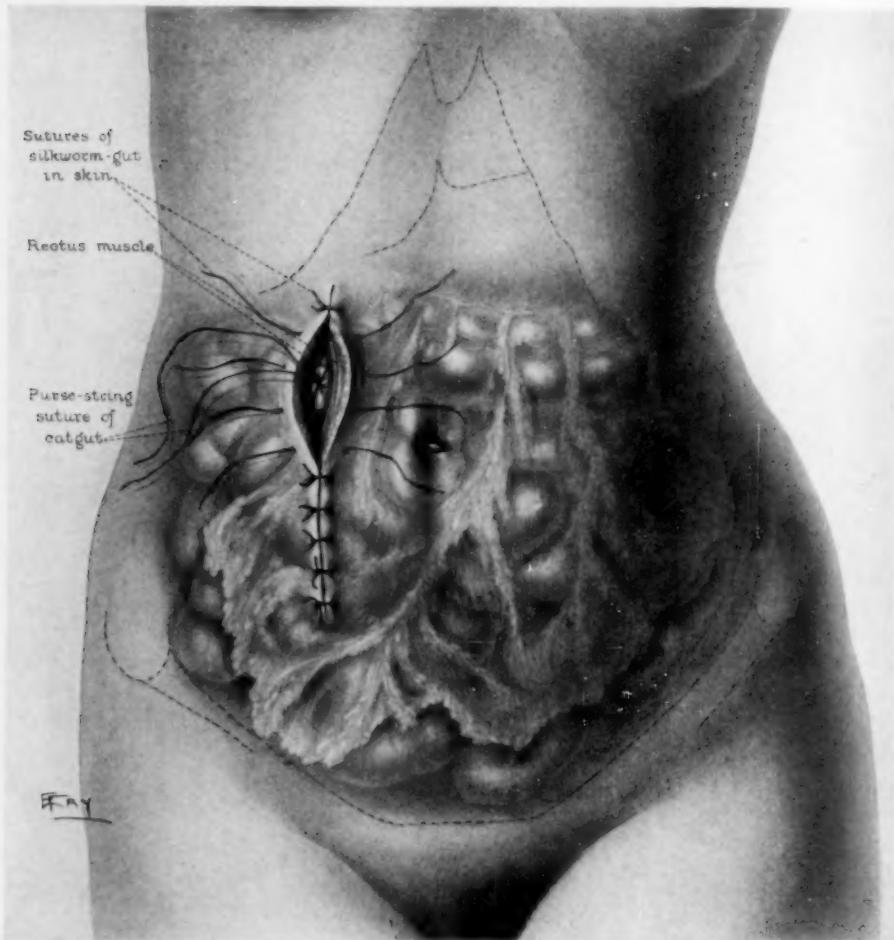


FIG. 6.—Closure partially complete with stump of colon in depth of wound and suture strands from the stump hanging externally.

porate the closed end of the colon (which extends 6.5 cm. beyond the site of anastomosis with the ileum) in the peritoneal closure of the abdominal wall, without allowing it to project into the muscle. The sutures which closed the end of the colon are left long and hang out as muscle and skin are closed. (Figs. 5 and 6.) A bit of gauze is inserted to overlie the end of the bowel. Should gas tension occur within four days, the gauze is removed, the threads drawn tight, the bowel punctured and a catheter inserted. Such an opening does not require a closure, but if there has been no trouble from

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paresis and gas, the gauze is removed on the fifth day, the threads of catgut cut short and an alcohol-pad dressing applied. This procedure is actually a life-saving device in case of need. Puncture can be carried out at any time. No anaesthetic is required, and only but a moment's work during the operation to plan for its application, if it is demanded. If not required within the first four days it will not be needed.

A fixed tumor by deep attachment on the mesenteric side often involves the duodenum or even the ureter. (Fig. 3.) There may be secondary attachment to the parietal peritoneum and often metastasis. In such cases extensive radical operations are usually ill-advised and unless an ileocolostomy is indicated to relieve obstruction, had best be cut short after exploration.

From January 1, 1915, to October 1, 1925, at the Mayo Clinic, 257 patients with carcinoma of the right segment of the colon were advised to undergo operation. Of these 141 are known to be dead, a few, however, did not die from carcinoma. There were thirty-four patients not traced in spite of every effort.

It was possible to resect the bowel in 143 cases, the Mikulicz operation being performed in eight for tumor of the hepatic flexure. In fifty-seven of the total cases the extent of the disease or the presence of metastasis made resection inadvisable, yet in thirty-three of these the obstruction necessitated ileocolostomy. The danger of any operation in the several conditions is about the same from the standpoint of the general or local condition and complications. There were forty deaths within the first month, and fifteen others within six months. A better showing is that eighty-nine patients lived from six months to two or more years, and that fifty-five of seventy-five patients have lived from one to four or more years. Better still, twenty-five patients have lived from six to eight or more years, and twelve of them are alive from eight to nine years after operation. It is not expected that ileocolostomy for carcinomatous obstruction without resection will greatly prolong life, or the question will arise why resection was not performed. At the best, the results of operations for carcinoma are not good, yet all patients die if the carcinoma is not removed. Many months of life may be made possible by a palliative operation, but resection for cases of advanced and fixed carcinoma may not lengthen life as much as a palliative operation. The decision is often most difficult.

COLONIC POLYPOSIS WITH ENGRAFTED MALIGNANCY*
A TECHNIC FOR REMOVING THE ENTIRE COLON INCLUDING THE RECTUM
By ROBERT C. COFFEY, M.D.
OF PORTLAND, ORE.

THERE is probably no benign process in which there is a higher incidence of malignancy than colonic polyposis. Erdmann and Morris in the April,

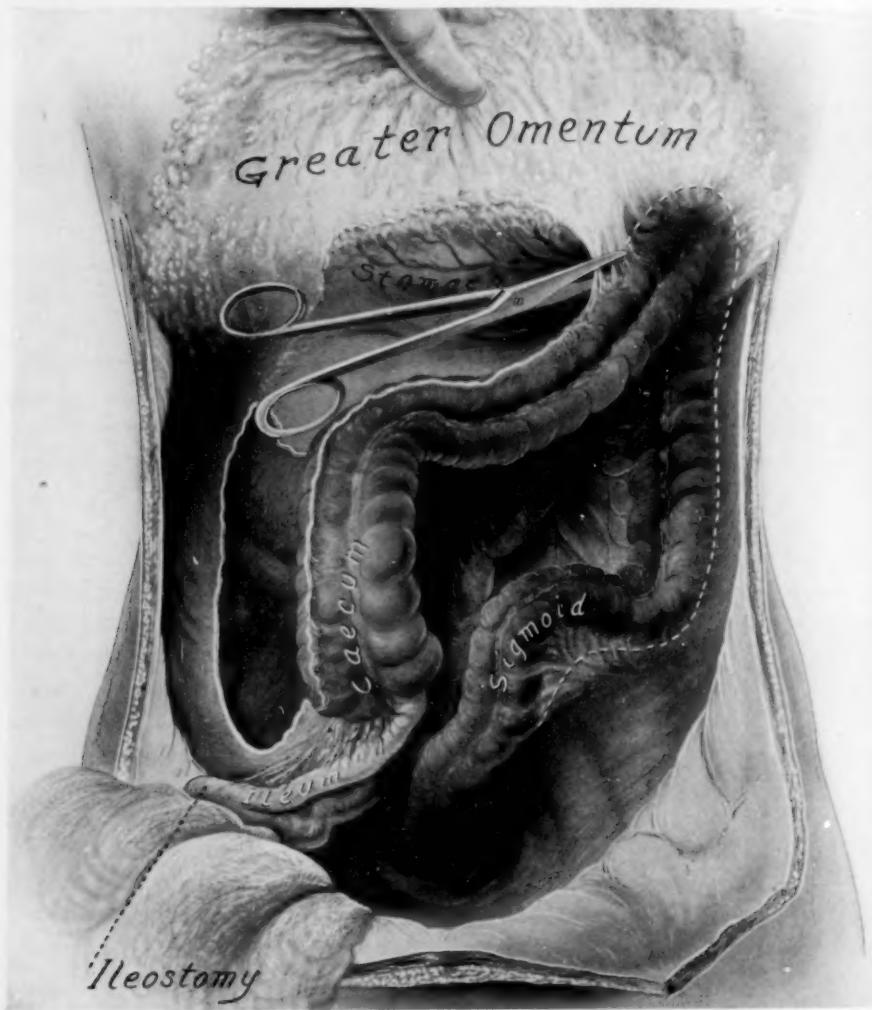


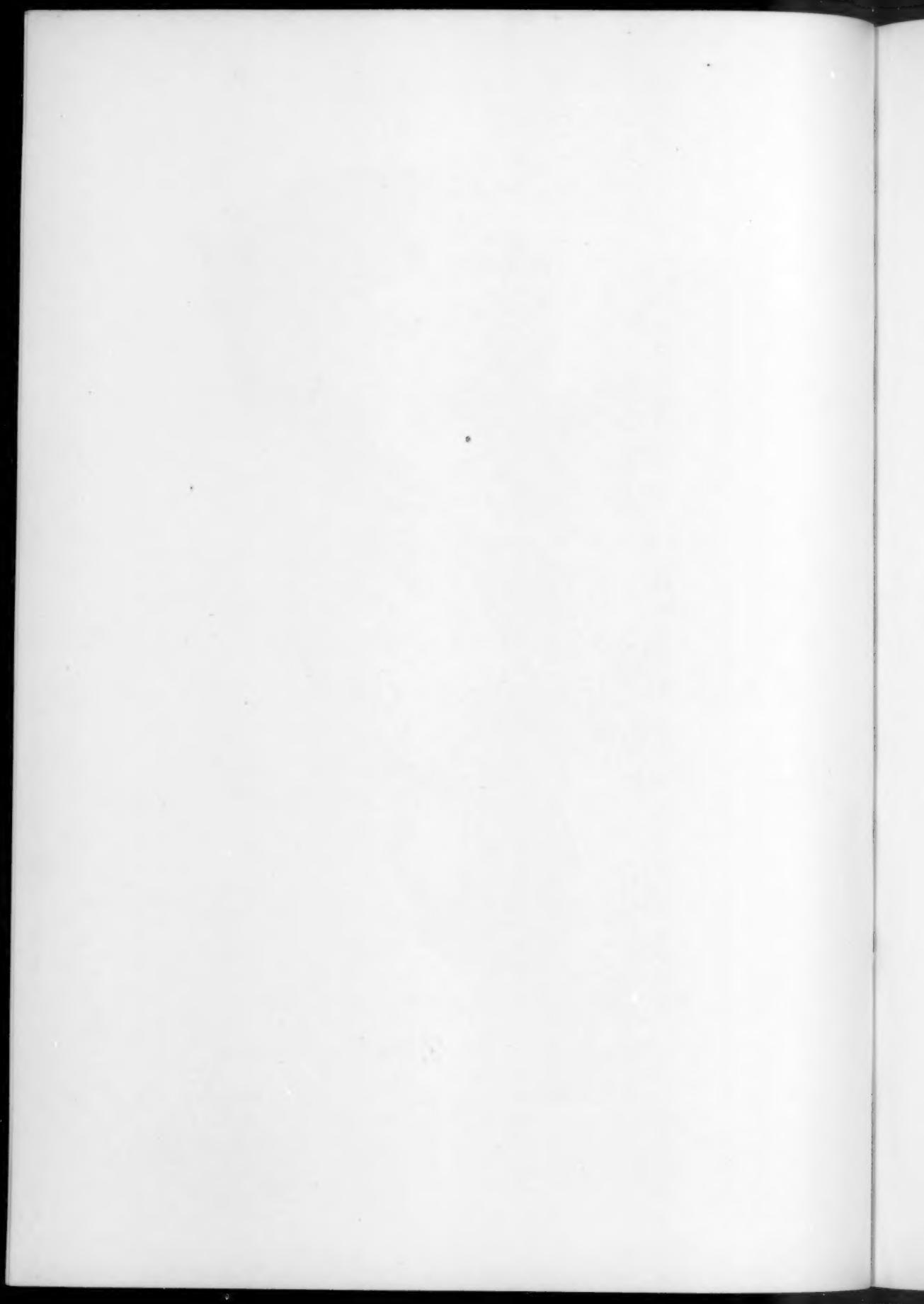
FIG. 2.—Colon being mobilized by cutting peritoneum outside of ascending and descending colon and cutting under surface of omentum from transverse colon.

1925, number of *Surgery, Gynaecology and Obstetrics*, have concisely covered the clinical picture of this disease. The closing paragraph of this article

* Read at the meeting of the Southern Surgical Association at Louisville, Ky., December 16, 1925.



FIG. 1.—Colonic polyposis with two areas of malignancy. Drawn from fresh specimen.



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dealing with the treatment of this condition, offers but slight hope in the way of cure. It follows:

"Indications for treatment are the depleting hemorrhage and diarrhoea and the high malignancy incidence. Non-radical, palliative treatment comprises caecostomy, appendicostomy, irrigations, and radium therapy. Radical, effective treatment, excision of the polyp bearing area, is limited by technical difficulties and the inability to predict, pre-operatively, the extent of the process."

It is in this connection that I hope to offer a slight contribution by relating a case which has a typical history of the acquired type of polyposis referred to by Erdmann and Morris. The process in this case involved the entire large intestine from the ileo-caecal valve to the anus. The entire mucosa was studded with literally hundreds of polypi. One large polyp located in the rectum was removed two years and four months prior to the final operation and at that time was classified by one pathologist as adenoma and by another as adenocarcinoma. Two years and four months of complete unilateral exclusion by ileostomy failed to reduce the mass of polypi. During this interval, two widely separated areas of definite malignancy developed. Cure was finally brought about by complete removal of the colon, including the rectum. The patient has lived a very comfortable life and is reported well one year and six months after operation.

It must be conceded that every disease should be treated on the basis of its pathology. It is quite generally conceded that colonic polyposis results from an antecedent inflammatory or ulcerative condition of the mucous membrane of the colon.

Hewitt and Howard, also Struthers and other authors, explain the development of polypi on the basis that polyposis results from colitis, dysentery and from resultant undermining ulcers in some such manner as the



FIG. 3.—Normal fusion of omentum and transverse colon. Dotted line shows point where incision can be made without severing large vessels.

following: Where blood supply is good (near primary arterioles) mucosa is preserved. Hyperplasia and regeneration of glands and submucous connective tissue takes place with amelioration of the ulcerative process. Margins are smooth and rounded off, causing rounded sessile projections. The mucosa regenerates about and over these elevated parts, even over surrounding sub-

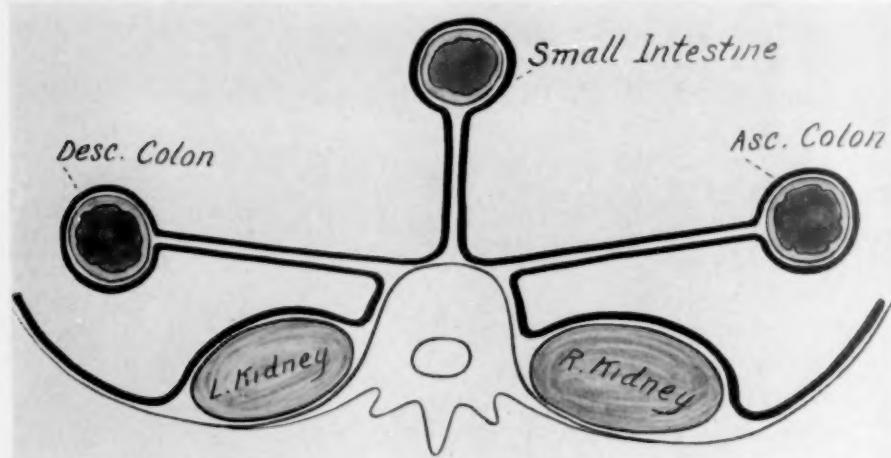


FIG. 4.—Scheme showing peritoneal arrangement in transection of infracolic compartment of abdomen before fixation of ascending and descending colon. (Redrawn from Huntington.)

mucosa and muscle layer. Coincident with healing, fibroblasts contract, leading to the occlusion of the orifices of the tubules situated in the elevations. Retention cysts are formed if there are secreting cells in the walls. Since there are more gland cells over the surface of the polyp than over the

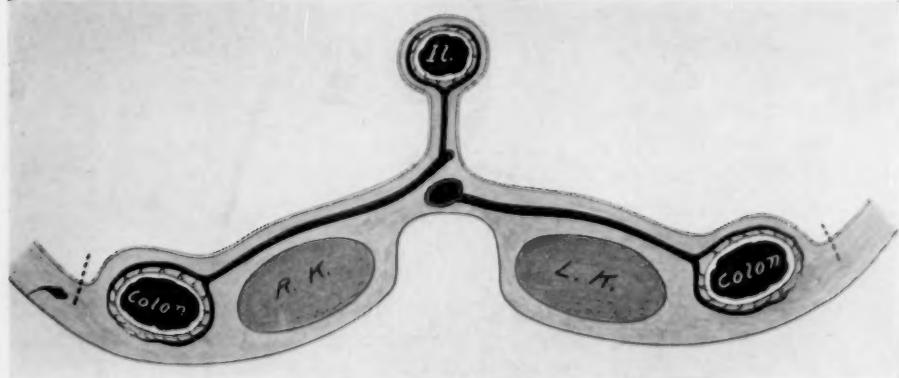


FIG. 5.—Normal attachment of ascending and descending colon. Dotted line indicates line of peritoneal incision for mobilization of the colon.

surrounding mucosa, the polyp may be a collection of small cysts. Pedicle formation is due to looseness of the submucosa and the drag on it by peristaltic pull on the tumor. If the blood-supply theory be true, the polypi should be found at the side of the colon and rectum where the principal blood-supply comes in. Hewitt and Howard claim this to be true. Struthers says

COLONIC POLYPOSIS WITH ENGRAFTED MALIGNANCY

it is not, although he also favors the ulceration theory of the polyp formation. In my case, the polyps covered the entire circumference of the intestinal mucosa. Ewing has very much the same conception of the development of this disease but lays particular stress on a chronological transition by successive steps from a diffuse thickening to hyperplasia; to lymphocytic infiltration; to the formation of new stroma cells, blood and lymph-vessels; to one of frank sessile or pedunculated tumor formation and finally to the development of adenocarcinoma. Erdmann says he has repeatedly been able to demonstrate in the same gross specimen all morphological gradations from simple

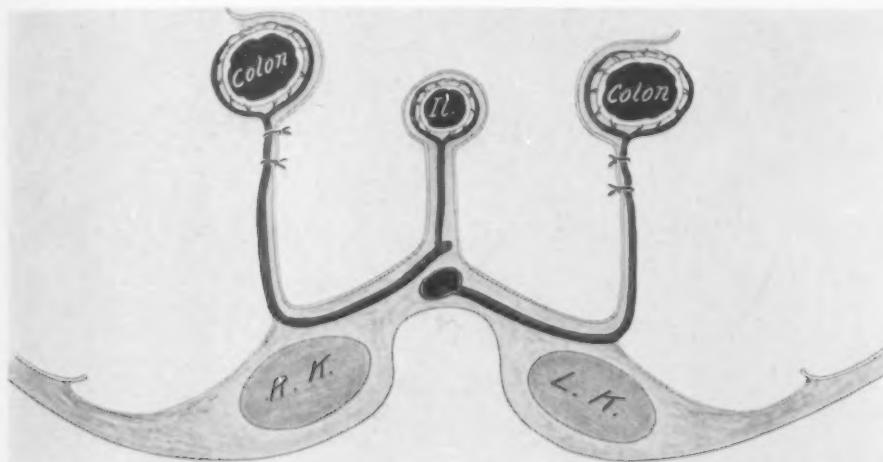


FIG. 6.—Ascending and descending colon mobilized. Diagrammatic view of ligatures.

polyps through early infiltrative tendencies on up to frank and unquestioned adenocarcinoma. He claims as Ewing's opinion that nowhere can the logical transition from simple inflammatory hyperplasia to tumors which are morphologically, pathologically and clinically adenomata and carcinomata, be more clearly demonstrated than in these cases of colonic polyposis.

Soper says that 43 per cent. of these colonic adenomas are malignant. Thorbecke believes that 50 per cent. of such polyps finally undergo malignant degeneration. Others believe that practically all such cases carry the potentialities of malignancy if the case lasts long enough. My case herein reported is quite typical of the more severe type of colonic polyposis.

July 18, 1922, a woman was admitted to our Clinic. She was aged thirty-nine, married thirteen years, one child. Nine years ago noticed a "running off of the bowels," lasting ten days—some blood. A recurrence took place twice during the next year and other recurrences with increased symptoms have been recorded since that time. Five years ago the patient had severe hemorrhage from the bowels lasting four or five days. The stools during this time were described as clotted blood. She was taken to the hospital where some relief was obtained. A year later she had influenza and what she called gastritis, followed by another hemorrhage lasting four or five days. Bowels were moving about once every hour, mostly blood. Nothing could be taken by mouth for three days. She now states that her stomach has been very weak for past six months. She says the intestine protrudes through the rectum for past year by which

she evidently means protrusion of the large polyp from the rectum. She has had cramps in calves of the legs and has had rheumatism in the shoulders. Has palpitation of the heart, dizzy spells, headaches, sometimes feels smothered. Physical examination in general revealed nothing. Proctoscopic examination as follows: Penetration 25 cm. Bowel wall studded with fungoid soft masses of tissue. These masses are irregular (wart-like) in outline and vary in size from that of a pea to a mass in the rectum

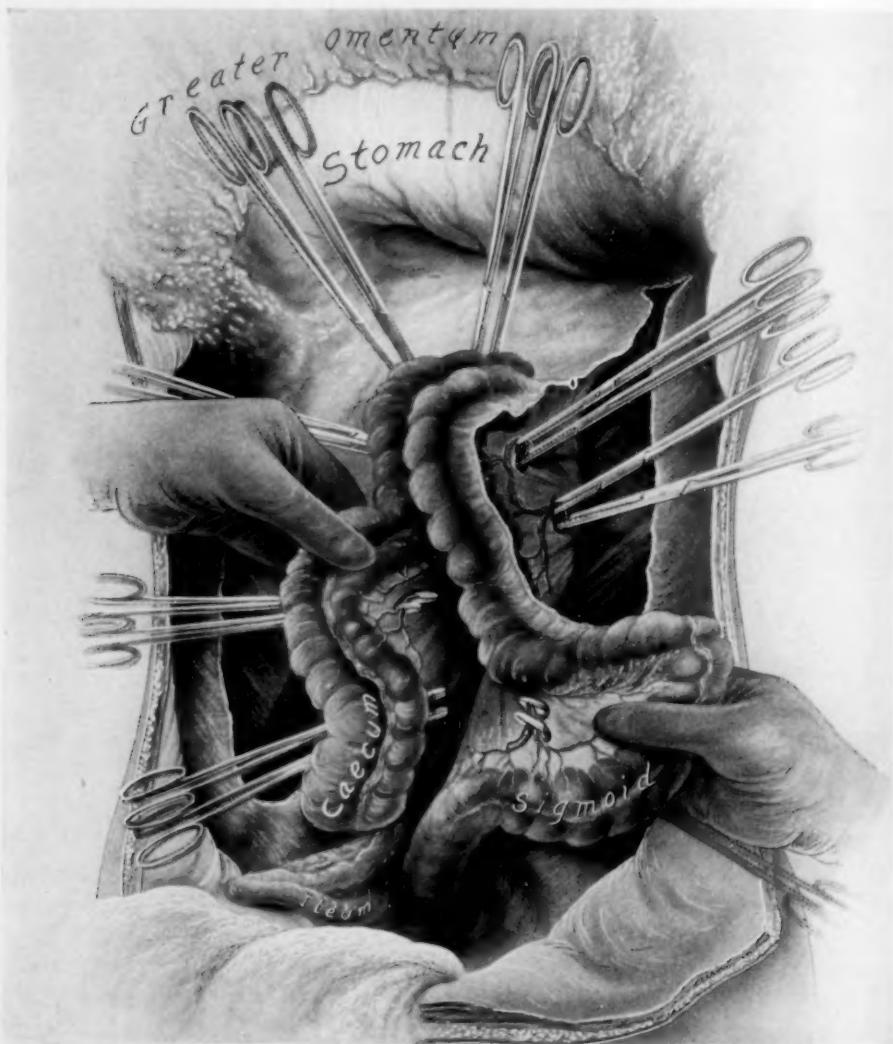


FIG. 7.—The entire large intestine is now easily pulled out through the abdominal wound. All the large vessels are in plain view and may be clamped and cut between the clamps.

which apparently is as large as a small hen's egg. There are numbers of ulcerating areas varying in size from a pin point to large ulcers (one large ulcer near the anus). Considerable bloody fluid. Entire wall injected and covered with much mucous. Upon examination the warm stool showed no amœba. Diagnosis: Colonic polyposis. Examination of the blood at that time did not show very great anaemia. On July 24, 1922, the patient was taken to the operating room of the Portland Surgical Hospital with the pre-operative diagnosis, "Multipolypoid growths in the rectum, one of which is very

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large." Operative findings: "Many polyps, varying in size from lima bean to an egg, discovered in the rectum and sigmoid." Operation: "Large tumor in rectum with underlying intestinal wall was removed. Specimen was examined by Doctor Foskett under frozen section, pronounced papillo-adeno-carcinoma. The abdomen was then opened. Large masses of polypoid growths were found occupying the entire length of colon, being most abundant in the transverse colon. The recorded statement of the operator was: "In consideration of the pathological findings in the large papilloma removed, it will be necessary to remove the entire colon. At this operation the intestinal limbs forming a loop of ileum are sewed together and brought through a stab wound in the right rectus muscle to be opened later as an ileostomy. A small strip of skin passes under the loop. Ileum will not be opened until the colectomy is done unless it becomes a necessity. Colectomy will be done in week or ten days."

Upon going over the specimen more carefully, the final pathological report was as follows: "Gross description: The tissue consists of masses of soft flexible cauliflower growths. No hard nodules are found. Paraffin section diagnosis: The growth consists of branching cauliflower-like processes each of which is covered by a single layer of tall cylindrical cells. These processes are highly vascular. The wall of the rectum is apparently not invaded by the growth, although the epithelium is slightly irregular in growth at the base of the processes. This is not definitely malignant. Papillomata of the rectum are, however, to be regarded as a potential cause of adenocarcinoma. Robert L. Benson."

After receiving this report, it was decided to let the patient go home with the ileostomy, the understanding being that she would return once every six months to have the rectum examined. This she did faithfully. There was no apparent change in her condition and no apparent change in the growth in the rectum until she returned November 21, 1924, two years and four months after the ileostomy was performed. At that time, the rectal growth showed evidence of decided extension. The haemoglobin was 78 per cent., the patient felt herself gradually going down. It seemed quite certain that the growth in the rectum was taking on malignancy. Therefore, the patient was advised to have a complete colectomy performed. The pre-operative diagnosis was: "Polyposis of the large intestine. Carcinoma of the rectum." Operative findings: In the midst of the mass of polyps in the rectum, there was an induration which had the appearance of malignancy. At the lower angle of the former abdominal incision a hard, fibrous tumor mass was found. It has the appearance of a malignant transplant. (Unfortunately no record can be found of the pathological examination of this specimen.) It is difficult to see how a transplant could have occurred from the former

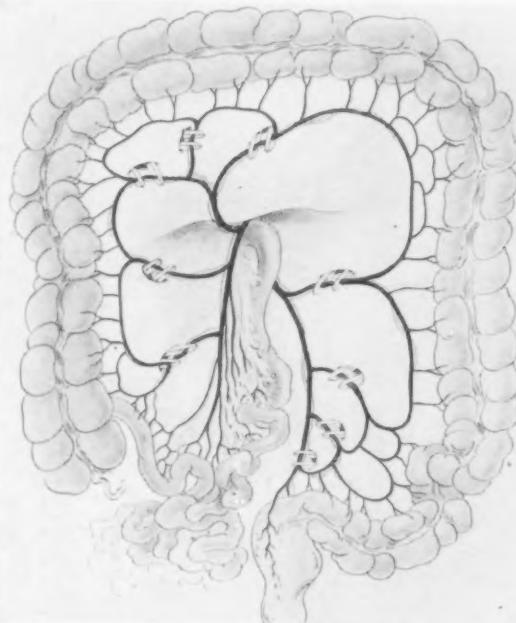


FIG. 8.—Diagram showing the colon dropped back into its normal position, tips of forceps coming in from behind.

ROBERT C. COFFEY

abdominal operation in as much as no intra-abdominal tissues were removed at that time. In addition to these two growths, there was another obstructing, annular growth in the descending colon just below the splenic flexure which had the appearance of undoubted malignancy. The entire large intestine from the caecum down, including the ascending, transverse and descending colon and sigmoid, as well as the rectum, were found studded

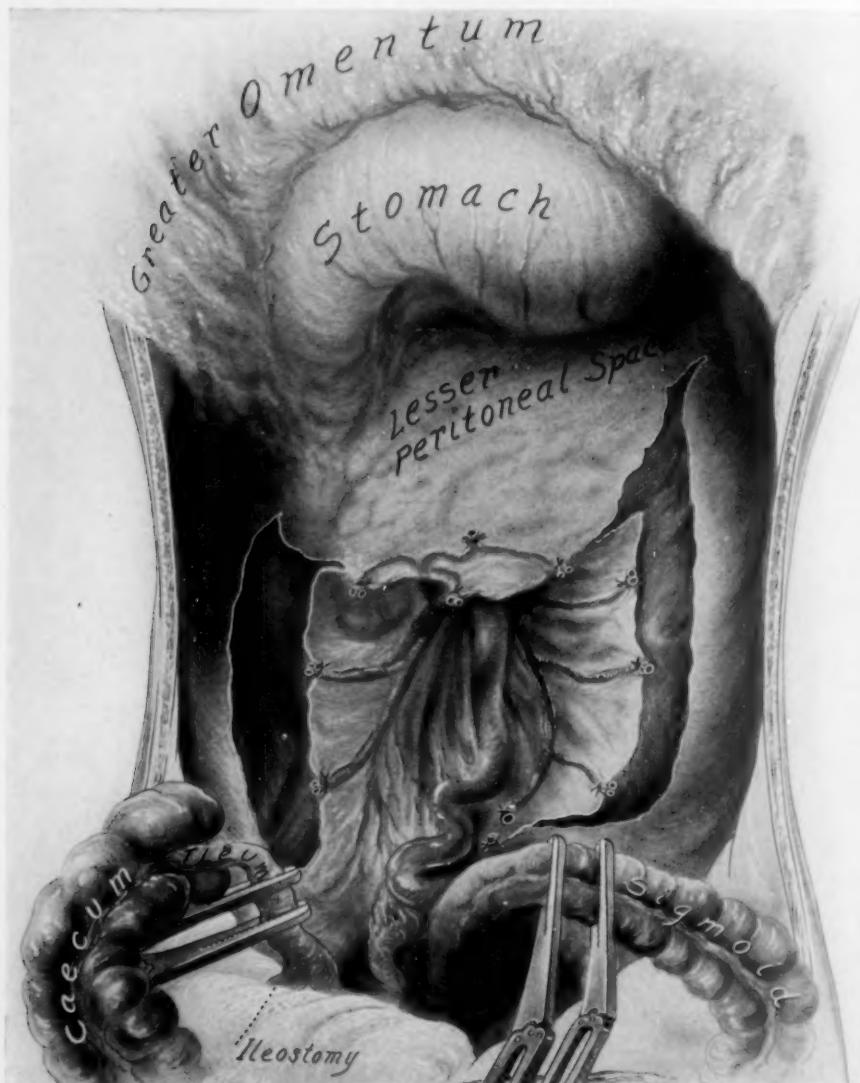


FIG. 9.—Vessels have all been severed and ligated. Clamps on the ileum and sigmoid ready for final removal.

with polypi. The transverse colon contained the largest mass. Here the intestine was as large as the middle part of a man's forearm and was filled with a polypoid mass. Some of the lymphatic glands in the transverse mesocolon were as large as black walnuts but they seemed to be of an inflammatory character. No adhesions had followed the former operation except a slight adhesion of the omentum in the neighborhood of the ileostomy wound.

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A technic for removing the entire colon, including the rectum which was used in this case, may be stated as follows: "An incision is made along the inner edge of the right rectus muscle to a point above the umbilicus. A transverse incision is then made from this point across the left rectus, making an "L" incision. The peritoneum external to the ascending colon is cut and the hepatic flexure mobilized. The peritoneal attachment of the omentum to the transverse colon is clipped, thus opening the lesser peritoneal cavity and exposing the posterior surface of the stomach (Fig. 2). The dotted line continuing from the point of scissors indicates how the omentum is further mobilized entirely across the abdomen. The costocolic ligament is cut and the peritoneum external to the descending colon and all the way down to the sigmoid proper is cut. This mobilizes the ascending and descending colon from the posterior abdominal wall and the omentum from the transverse colon (Figs. 3, 4, 5 and 6). The intestine, from the ileum to the sigmoid, is now easily lifted and pulled out through the abdominal incision. The vessels external or posterior to the mesocolon are standing out in plain view and may easily be clamped with artery forceps from the external or posterior surface of the mesentery (Figs. 7 and 8). The vessels are then severed between their clamps and the partially detached intestine is delivered through the abdominal wound. The proximal ends of the vessels held in clamps are firmly ligated, leaving the raw bed of the ascending and descending colon and the ligated vessels in the mesenteries exposed (Figs. 9 and 10). The double clamps on the sigmoid and on the ileum are allowed to remain in position without opening the intestine until all abdominal suturing is completed down to the promontory of the sacrum. A continuous catgut suture now begins at the point from which the cæcum has been removed. The bed of the ascending colon is covered over by continuous suture. The omentum is



FIG. 10.—Omentum severed from transverse colon completely opening up lesser peritoneal cavity.

drawn down in the continuous suture and sutured to the lower peritoneal leaf of the transverse mesocolon, entirely across the abdomen, thereby closing and restoring the lesser peritoneal cavity. The suture is then continued until the bed of the descending colon is closed. The superior hemorrhoidal vessel is now doubly ligated and severed as it crosses the promontory of the sarcoma. With a long-handled scissors curved on the margins and with a probe point on the under blade, the peritoneal leaves of the mesosigmoid are severed all

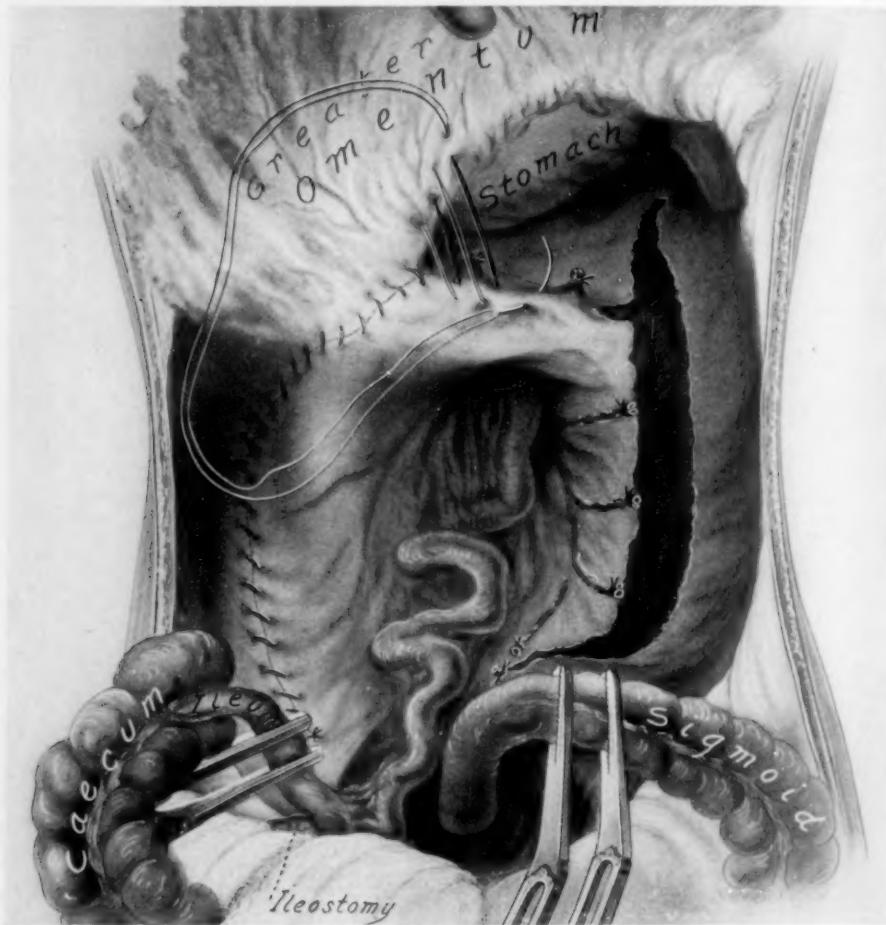


FIG. 11.—Peritoneum of the mesentery now brought over to the lateral edge of peritoneum. The omentum is brought down and sutured to the mesentery which gradually reestablishes the lesser peritoneal cavity.

the way down to the cul-de-sac where the incisions meet in front of the rectum. The fingers of the left hand are now insinuated between the sigmoid and the sacrum so as to separate all the fat and glands in the hollow of the sacrum down as far as the tip of the coccyx, just as if an operation for primary cancer of the rectum were being done. A rectal tube has previously been passed, to the end of which the inverted portion of the sigmoid is sutured by one strong suture. A nurse now pulls on the rectal tube and the end of

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the sigmoid is drawn out through the anus, thus producing an intussusception. A stab wound is made in the upper end of the vagina, a drain is placed through this opening into the hollow of the sarcoma so as to cover the invaginated end of the sigmoid. If the patient is a woman the uterus is now tilted backward and made to form a roof for the lower pelvis which has

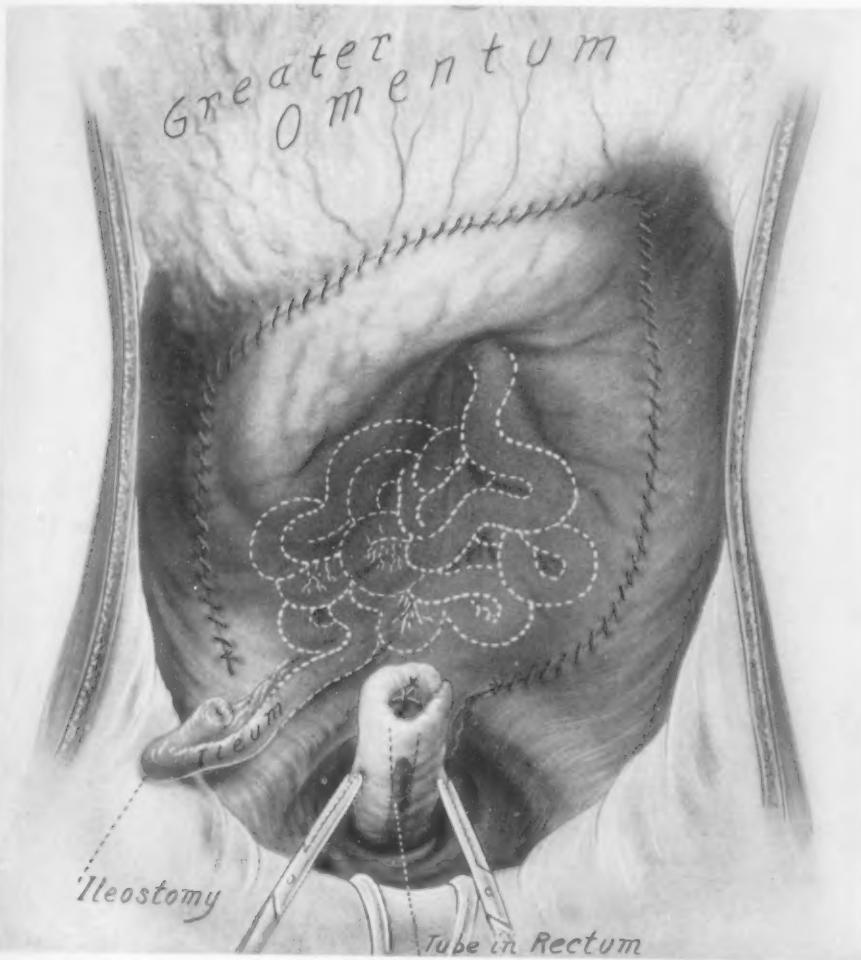


FIG. 12.—The line of suture is continued down the left side. Superior hemorrhoidal artery severed, distal end of sigmoid is closed with a purse-string, the end is attached to a rectal tube in the rectum. By pulling on this tube, the sigmoid is drawn out through the rectum. (See operation for cancer of the rectum.)

been drained and at the same time to form an unbroken floor for the abdomen (Figs. 12, 13, 14 and 15).

About ten days after this first operation, if the patient is in good condition, the inverted rectum may be removed. In the female, the vaginal mucosa is split down to the rectal mucosa, the perineal body is cut, an incision is made far around the anus which permits of the removal of all the anal muscles. The fingers are then inserted along the vagina through the drainage tract and

the rectum and all the fat, and including the anal muscles, are peeled out, as shown in Figs. 9 and 10, pages 505 and 506, of the article on "Treatment of Cancer of the Rectum," published in *ANNALS OF SURGERY*, October, 1922. The perineal body is sutured. The recto-vaginal septum is not sutured. The cavity in the hollow of the sacrum and ischio-rectal space lying above the perineum is packed with gauze, which remains for three or four days, after which the wound is permitted to heal. If the patient be a man, the drainage

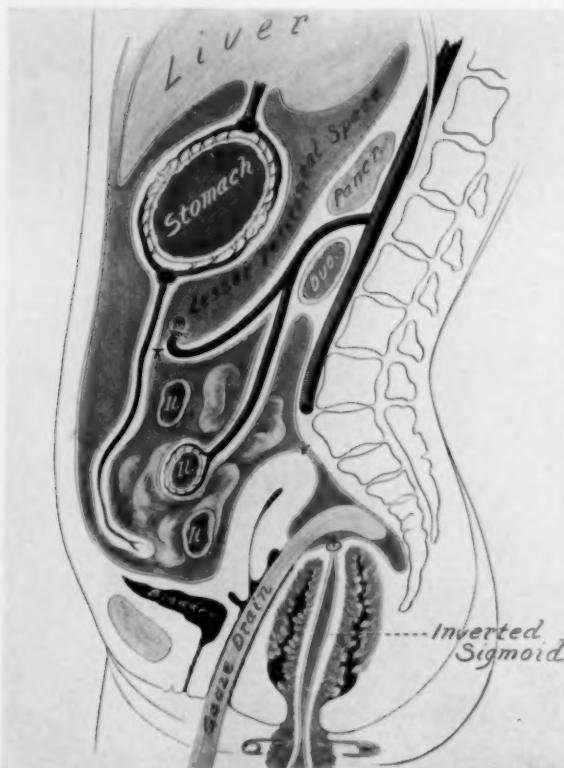
will have been placed as shown in Figs. 6 and 8, pages 503 and 505, respectively, and the removal is shown in Figs. 11 and 12, pages 507 and 508, of the article on "Treatment of Cancer of the Rectum," published in October, 1922, *ANNALS OF SURGERY*.

In the case I have reported, the major operation of colectomy was performed on November 22, 1924, and the rectum was removed on December 2, 1924. I have recently seen the patient and examined her. She is in perfect health and is comfortable. No evidence of recurrence. I have treated two similar cases in past years by temporizing surgical measures of one kind or another and in both instances the patients died

FIG. 13.—Segmental view showing the relation of the patient's abdominal organs and cavities after operation of anatomical complete colectomy. The rectum remains for another operation which can be done by splitting the vaginal wall or taking off the coccyx. In either case the operation is very short, requiring only 5 or 10 minutes. This operation was performed when the colored specimen entitled "colonic polyposis" was removed. Patient is alive and well over a year after operation.

without completion of any satisfactory treatment. Having had a year to think of this case since this operation, the conclusion has been reached that all the surgical demands involved in the situation are met in this procedure.

Lockhart-Mummery has the following to say concerning the radical surgical treatment of colonic polyposis: "The disease is a very serious one. The patient suffers from severe and intractable diarrhea and bleeding. There is often severe and distressing tenesmus, and rapid loss of weight and wasting. Moreover, there is every probability that cancer will develop, if it has not already done so.



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"Under these circumstances any operation would seem justifiable that affords a possibility of removing the disease. The only method that offers any reasonable prospect of dealing adequately with it is resection of the entire colon. This was done in Lilenthal's case after a previous ileo-sigmoidostomy.

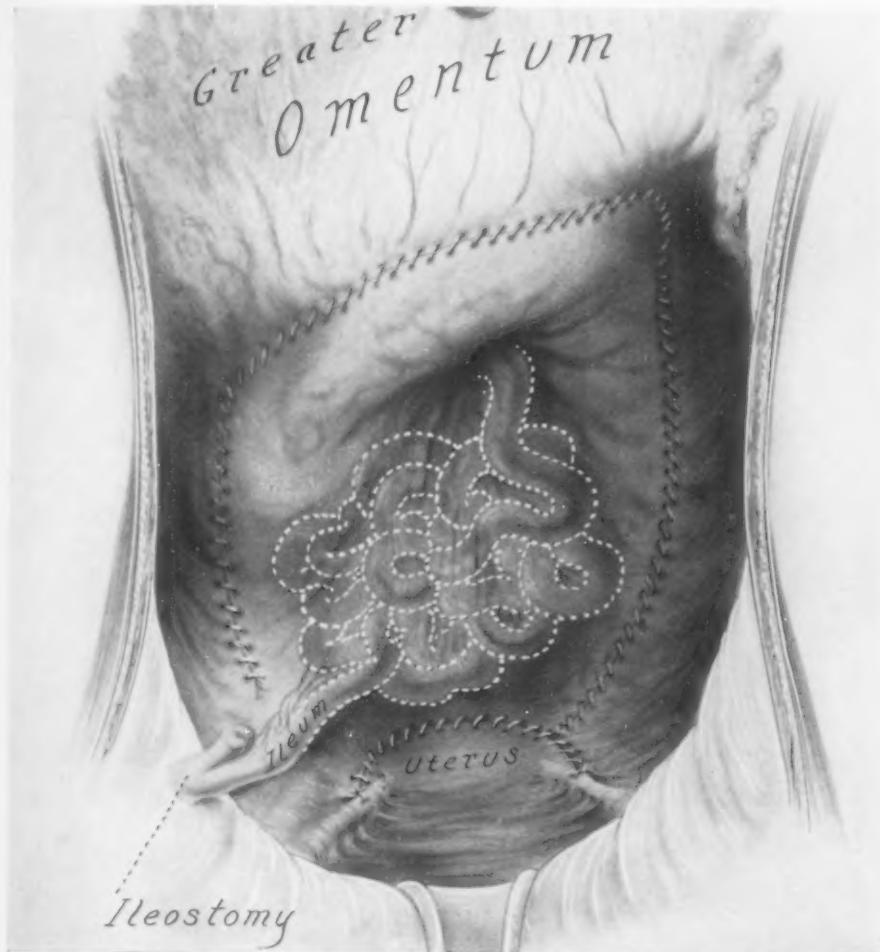


FIG. 14.—Uterus tilted backward, entire abdomen closed off. On the right side of the patient, the loop of ileum forming the ileostomy is seen passing through abdominal wall. Note that the lesser peritoneal cavity has been completely closed off.

and the patient recovered. This was probably the first instance in which resection of the entire colon was performed.

"Unfortunately, the rectum is usually affected together with the colon, so that the whole of the disease cannot be removed; but if the anastomosis is made low down, the polypi in the rectum could in most cases be removed later, and at any rate, this operation seems to be the only one at all worth considering.

"The following case is, I believe, the only one in which complete colectomy has been done as a primary operation for this condition." The

operation is reported as having taken place March 18, 1918, at which time "the ileum was divided near the cæcum and its proximal end anastomosed to the distal third of the pelvic colon. The entire colon above was then excised. Further operation was performed on April 22 and the rectum cleared of polypi through an operating sigmoidoscope. The patient made a good recovery, and was discharged on May 17, 1918." Her condition

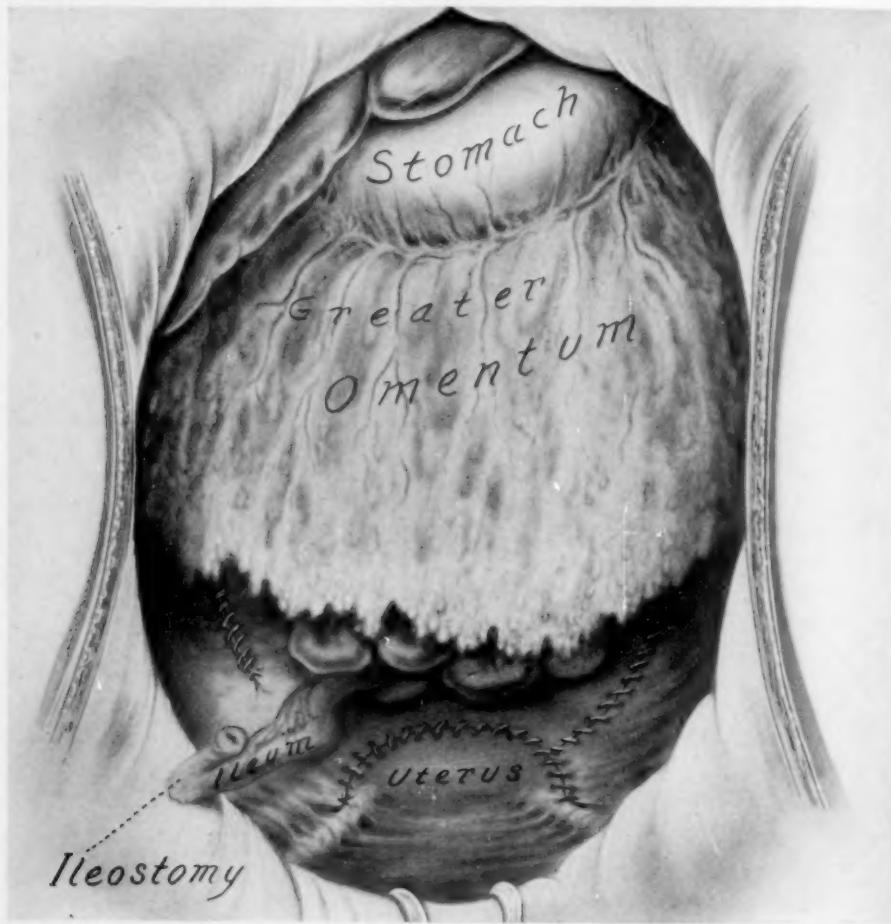


FIG. 15.—Normal relation in the abdomen following complete colectomy. The omentum drops down over the small intestine in a normal way.

remained well and satisfactory up to the time his book was published in 1923. He makes the further remarks:

"Resection of a cancer of the colon which is found to be associated with multiple polypi is apparently not worth doing unless the rest of the colon is either removed at the same time or subsequently. The evidence available seems to show that cancer will recur in some other part of the colon if it has not already done so."

It is at once apparent that the operation performed by Lilienthal and the

COLONIC POLYPOSIS WITH ENGRAFTED MALIGNANCY

one performed by Lockhart-Mummery were not applicable in such cases as the one I have just described on account of the multiple malignancies. I think even without the malignancy that it would have been impractical to have performed any other operation than the one that was performed when one considers the massive polypoid involvement of the rectum and sigmoid.

Before closing this discussion, I would like to stress some of the anatomical and physiological points in connection with the operation of complete colectomy. To do a complete colectomy on the quadruped, notably the dog, is much simpler than to do it on the human being, for the reason that the large intestine has a long mesentery throughout its entire length. In the human being certain prenatal fixations have taken place. The ascending and descending colon have fused with the posterior parietal peritoneum and are thereby fixed. The omentum, as it has grown down over the transverse colon, has become attached to the front surface of the human intestine. It is well to note that this attachment is only fusion or adhesion of two peritoneal surfaces and that there are no important vessels connecting the omentum with the colon. Therefore, it is a very simple matter to detach the omentum from the colon without injuring either the omentum or the colon. By thus freeing the omentum, the lesser peritoneal cavity is laid open. The transverse colon has a long mesentery. Therefore, after the peritoneum has been cut external to the ascending and descending colon and the omentum has been severed from the transverse colon, the entire large intestine is easily drawn out through the abdominal wound (Fig. 7) where the vessels can be clamped and ligated (Fig. 7). In short, if we will remember the special prenatal fixations peculiar to the embryological development of the human being, we will at once see that the most important part of the operation of colectomy

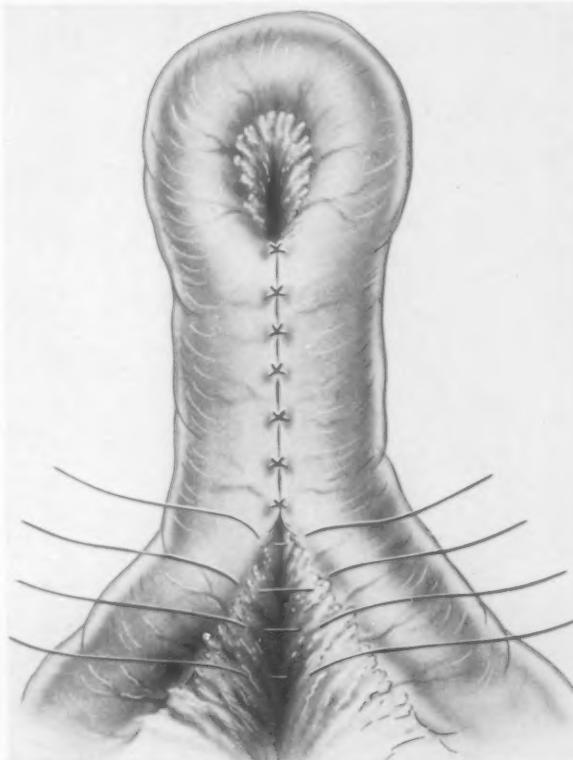


FIG. 16.—Limbs of loop of ileum sewed together at the mesenteric border with interrupted linen sutures. Mesenteric angle being closed with tied sutures.

is that the special prenatal fusion shall be undone and the mesenteric attachments reduced to the quadruped or canine stage.

In deliberately planning this operation, I think it would probably be well to do the operation in three stages, just as we have done in this case, except that the interval between the ileostomy and colectomy should be, of course, much shorter and the length of time adjusted to suit the case in the judgment of the operator. Of course, it will at once be apparent that the proctec-



FIG. 17.—Loop of bowel brought through stab wound in right rectus. Peritoneum, aponeurosis and some muscle fibres sewed around the loop with button-hole stitch of fine chromic catgut. Strip of skin being drawn through the mesentery of the intestinal loop. Skin flap being drawn through intestinal loop, to be sutured to skin on opposite side.

tomy should be left for a separate operation, just as we have recommended for removal of carcinoma of the rectum ordinarily. The question may be asked, "Why do the ileostomy at a separate operation?" It may in the majority of cases be unnecessary. Yet, in the extremely emaciated, exhausted patient, it is often very important to conserve every possible force. In doing an ileostomy, it is necessary to remember that according to physiologists, the caecum normally absorbs from 80 to 90 per cent. of the fluids. When the ileostomy is first made the discharge is very thin, contains a great deal of bile

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and other intestinal secretions, and is very irritating to the skin. All of this 80 per cent. of fluid, which should be reabsorbed in the cæcum, is poured out through the ileostomy opening. As the days and weeks go by, the small intestine takes on the function of the cæcum and absorbs these extra fluids until within a short time in the average case, the discharge from the ileostomy is of semi-solid or mushy consistency. In other words, a normally functioning abdominal mechanism has been established. It would appear that by turning out this thin watery discharge of fluid and intestinal secretion, a very weak patient would be further depleted by this loss and the patient's chances for recovery following such an enormous operation might be decidedly reduced.

Another point which is very important in considering a permanent ileostomy may be mentioned. To Dr. John Young Brown, more than any one else, must be given the credit for having demonstrated and urged the practicability of an ileostomy and its advantages over a colostomy when it can be used. My head nurse recently asked the question, "Why do you not always do an ileostomy rather than a colostomy? The ileostomy is so much more comfortable for the patient, is so much less care and is entirely devoid of odor while a colostomy is always an offensive affair." Of course, I had to explain the ileostomy was not always practical. Brown had cases in which permanent ileostomies had existed ten to fifteen years, patient maintaining perfect health all the time. I have several cases in which the ileostomy opening has functioned for several years. As far as may be determined from these cases, the colon is not essential to the perpetuation of human life and health. However, there is a very great difference in the way an ileostomy is performed. If a loop of bowel is simply brought out in an aimless sort of a way and attached in the abdominal wound, an ileostomy may be a very inconvenient opening in that there is a tendency to formation of a hernia of the mucous membrane and even the intestine. This is entirely prevented by the following technic.

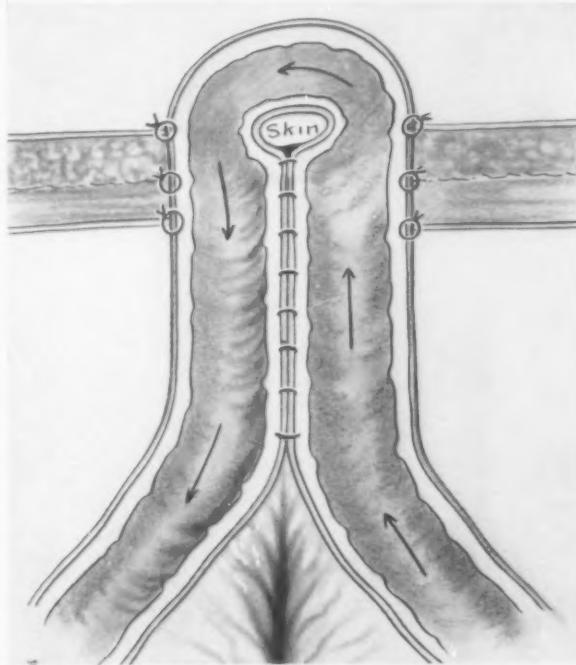


FIG. 18.—Sectional view of loop showing attachment to layers of the abdominal wall. Skin strip supports loop from beneath. The sutures between the limbs prevent undue prolapse of intestine.

If the abdomen has been opened for exploratory purposes, a loop of intestine 8 to 12 inches long is lifted up and the two limbs of the loop sewed together near the mesenteric border for a distance of about three inches. At the apex of the loop a small space is left through which an artery forceps is thrust for the purpose of drawing a narrow, mobilized piece of skin from the edge of the abdominal incision through the mesentery just beneath the intestine but just above the line of intestinal sutures. This is done after the

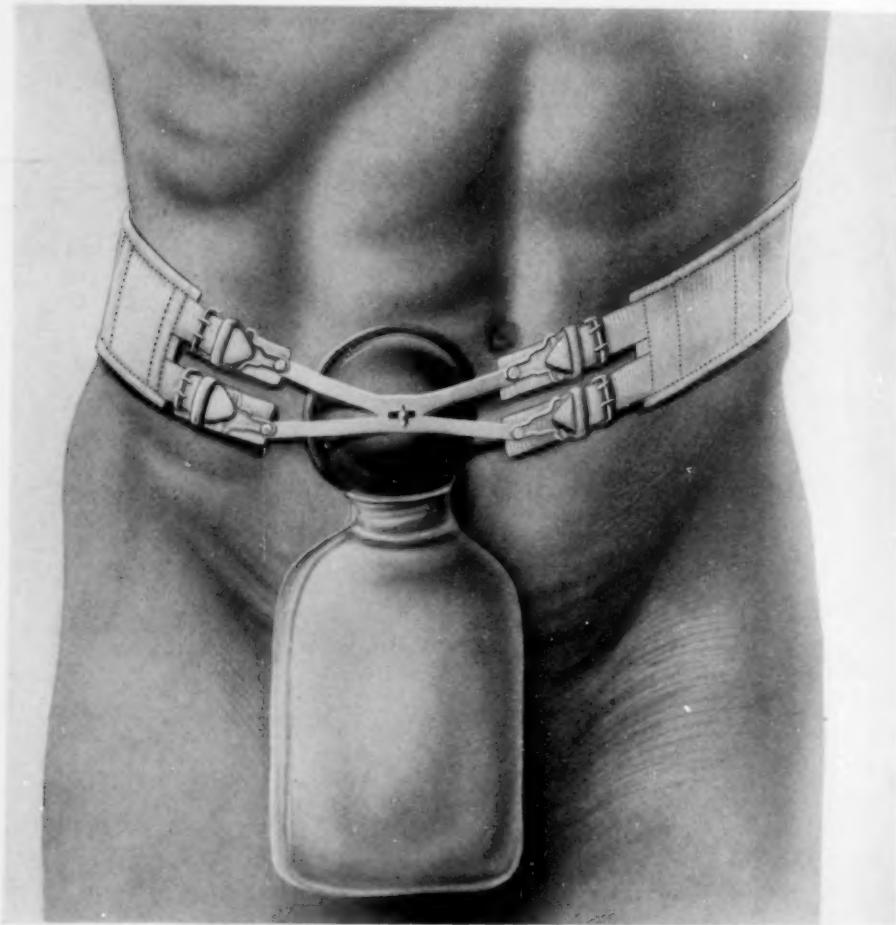


FIG. 19.—Delatour colostomy bag. (Tiemann and Co., New York.)

intestine has been drawn out through a small stab wound and its wall has been fixed to the deeper layers of the abdominal wall. In this way it is impossible for the intestine to draw in or push out. Therefore, after the intestine has been opened as much of the mucous membrane can be destroyed as is necessary to make a convenient inconspicuous opening.

HÆMOSTASIS IN SUPRAPUBIC PROSTATECTOMY*

BY VERNE C. HUNT, M.D.

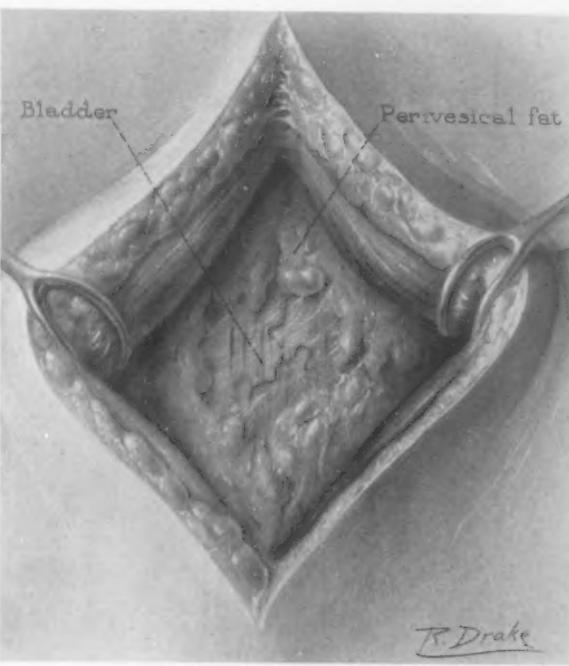
OF ROCHESTER, MINN.

FROM THE DIVISION OF SURGERY OF THE MAYO CLINIC

DURING the last twenty-five years there have been radical changes in both the suprapubic and perineal methods of performing prostatectomy. In the early years of prostatic surgery, the results of the operation were judged only by the return of voluntary urination. However, as the indications for prostatectomy have broadened and included, besides the cases in which voluntary urination was impossible, those characterized by intermittent acute retention, large or small amounts of residual urine, and frequency of urination, the results of operation have been determined not only by the return of voluntary urination, but in terms of the physiologic function of the bladder. With the improvements in the operation, the ultimate functional results of the perineal and suprapubic methods have been equally good when performed by those skilled in the respective methods. Until recent years the perineal operation has probably been accompanied by a lower mortality rate than the suprapubic, as a result of the modifications contributing to the safety of this method presented from time to time by Young, Geraghty, Hinman, Davis, and others. On the other hand, suprapubic prostatectomy has recently been modified and made safer so that there is now little choice between the two methods from the standpoint of ultimate functional results and mortality rate.

The mortality rate in this field of surgery depends on pre-operative preparation, the type of anaesthesia, and haemostasis. My own experience,

FIG. 1.—Exposure of the bladder; it is identified by its muscular structure. Distention unnecessary.



* Read before the North Central Branch of the American Urological Association, December 11, 1925.

reported elsewhere,⁹ has shown that the surgical mortality rate has been almost as high in those cases of prostatic obstruction in which, the surgical risk being regarded as slight, no pre-operative treatment was undertaken, as it has been in the cases in which the surgical risk was great and adequate treatment was instituted preliminary to prostatectomy. Unquestionably there is a distinct relationship between pre-operative treatment and mortality rate, and this has led to the adoption of a routine of pre-operative preparation in all cases of prostatic obstruction; this consists primarily of drainage of the bladder.

The depressant effect of anaesthetics on the kidneys has been obviated and the incidence of post-operative pulmonary complications largely eliminated by avoiding the inhalation types of anaesthetic. Regional anaesthesia is effective and possesses none of the disadvantages of general anaesthesia.

Haemostasis in performing prostatectomy has not been given the consideration it has received in other fields of surgery. The effects of loss of

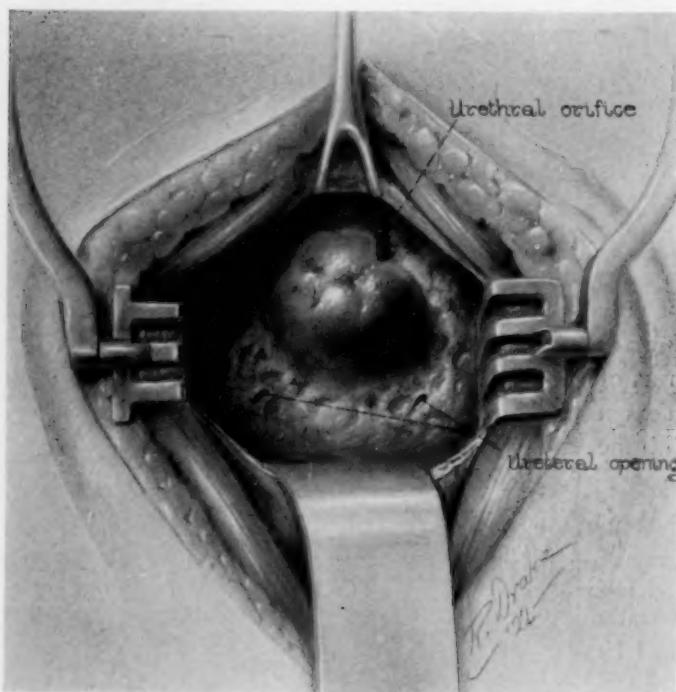


FIG. 2.—Visible prostate and interior of bladder.

blood after prostatectomy have been minimized. However, no single factor so lowers the resistance to infection and depletes the organic reserve as continued loss of blood after operation. It has been accepted without protest, and with little thought of its effects, that bleeding from the prostatic cavity for several days is but a natural and unavoidable sequel to removal of the gland, whereas the same loss of blood after operation in other fields causes considerable concern.

Various methods have been utilized tending to control bleeding partially, and ultimately decrease the total loss of blood. Massage of the prostatic capsule immediately after removal of the gland has controlled, to some extent, bleeding from the interior of the capsule. Irrigation of the capsule with hot solutions, such as boiling water, boric acid solution, and hot bichlorid solution,

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probably first suggested by McGill in 1888, has been used. Packing the capsule with fat, in the expectation that it will subsequently be absorbed, has been advocated. Ingenious methods of maintaining tampons in the capsule by sticks protruding through the suprapubic wound¹ to facilitate pressure, which are removed subsequently, and methods of suturing the capsule have accomplished a certain degree of haemostasis. Thromboplastic substances, chiefly cephalin, have served to control post-operative bleeding partially. Before the advent of the Hagner bag and Pilcher's modification, the best means of controlling bleeding from the prostatic capsule was in my experience to pack the capsule with iodoform gauze, and allow it to remain in place for several days. However, while this has been effectual for the most part, its effectiveness is the result of the gauze becoming enmeshed in the granulation tissue of the prostatic capsule; when it is removed bleeding of variable degree is often precipitated and occasionally severe secondary hemorrhage has resulted.

The one-stage operation affords exposure and visualized conduct of the operation, which are principles so necessary to accuracy (Figs. 1, 2, 3, 4, 5). The operation in a visible field gives opportunity for the placing of interrupted sutures (Fig. 6) at the vesical neck, the importance of which has been emphasized by Cabot, Judd, Walker, and others. Inasmuch as 75 per cent. of patients, when carefully prepared by permanent urethral catheter, may be operated on with safety by the one-stage visible operation, all bleeding from the vesical neck may be accurately controlled by suture. However, the interior of the prostatic capsule is not accessible for the control of bleeding by suture and ligature, as in other fields of surgery.

The bag presented by Hagner answered a distinct need and served as an excellent means of haemostasis within the prostatic capsule. It possessed the advantage of not precipitating bleeding with its removal. Pilcher's modifi-

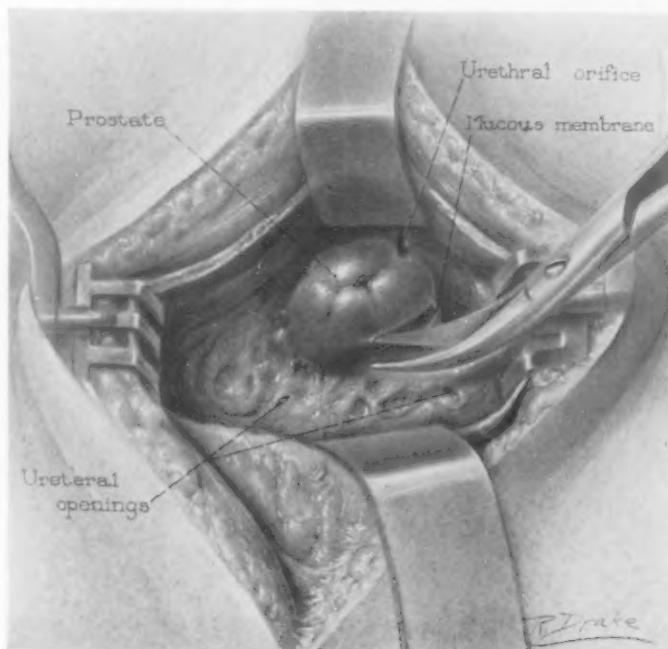


FIG. 3.—Incision of mucous membrane overlying the intravesicle portion of the prostate obviates irregular tearing of mucous membrane by blunt dissection.

cation of the Hagner bag provides for urethral drainage of the bladder, its contour conforms well to that of the prostatic capsule, and it offers a means of providing traction on the bag to maintain it in position. Either bag is more effective in controlling bleeding from the prostatic capsule than any other method previously presented.

While the bag may be used to advantage in both one-stage and two-stage operations, the operation in a visible field allows control of bleeding by suture at the vesical neck and accurate placing (Fig. 7) of the bag so as not only to control the capsular bleeding, but also to supplement the haemostasis by suture of the vesical neck. It has been my experience that it is inadvisable to place

the Pilcher bag entirely within the prostatic capsule, the best results being obtained when it is allowed to impinge on the vesical neck (Figs. 8 and 9) or internal sphincter. Inflation of the bag in this position affords perfect haemostasis without necessitating the use of gauze as well; the bag tends to remain in position with moderate traction

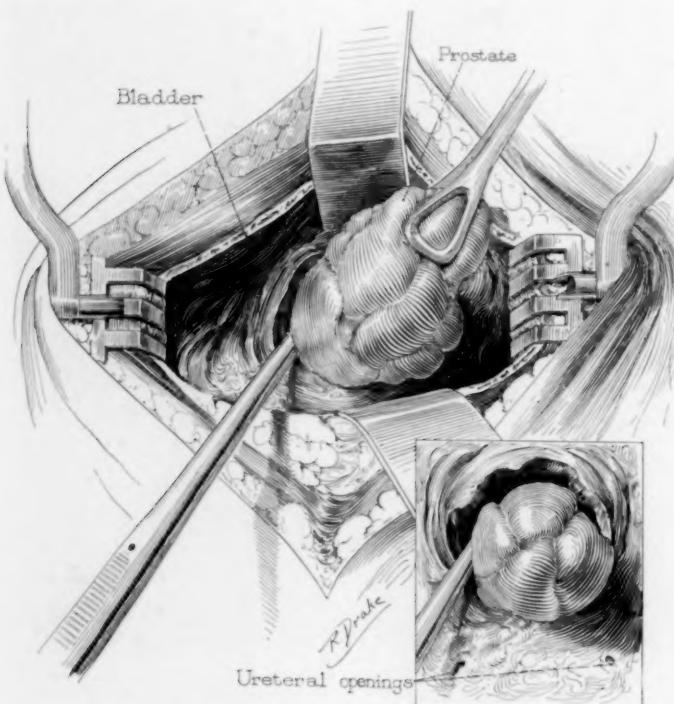


FIG. 4.—Visible forceps method of enucleation of the gland.

and is easily removed. While air has been recommended for inflation of the bag, I have found water preferable, for the volume can then be measured and the degree of inflation more readily controlled than it would be by the use of air.

Considerable difficulty was encountered in my early experience with the bag, particularly as regarded the amount of its distention, the amount of traction necessary to oppose vesical tenesmus and to maintain the bag in position, without causing post-operative incontinence, and the maintenance of that traction without variation. The amount of distention necessary is not constant, but varies with the size of the prostate and the size of the capsule after removal of the gland. Excessive distention of the bag is not essential to the complete control of bleeding and may exert a harmful effect

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on the sphincters of the bladder; overdistention of the bag may cause it to thin out in one portion with subsequent rupture and defeat of its purpose. The maximal distention to which a bag may be subjected is that of about 180 c.c. of water, which exerts a pressure equivalent to about 140 mm. of mercury within the prostatic capsule. This amount of distention is rarely necessary even after removal of the largest glands. The minimal distention for the smallest prostatic capsule for complete haemostasis is that produced by about 60 c.c. of water, which exerts a pressure of about 60 mm. of mercury. After removal of the average-sized gland, rarely is more than 120 c.c. of water required, and pressure varying between 60 and 80 mm. of mercury is sufficient to control bleeding from the prostatic capsule and vesical neck. It is important not to distend the bag any more than is just sufficient for complete control of bleeding.

Unless the bag is allowed to lie entirely within the prostatic capsule, which decreases the effectiveness of its control of bleeding from the vesical neck, some form of traction is necessary to maintain the bag in position and prevent the effect of vesical spasms on its position. Strapping the urethral tube of the Pilcher bag to the thigh provides traction which is not constant but varies with the position of the thigh. Hamer has devised a method of maintaining a constant and invariable degree of traction in the form of a pubic or perineal tripod, a modification of which I have always used with the Pilcher bag (Fig. 10). This maintains a constant and invariable degree of traction by virtue of the unchangeable distance between the bag and the point of fixation of the traction. In my early experience with the bag and this means of maintaining traction, about 25 per cent. of the patients experienced temporary post-operative incontinence which in several instances persisted as long as

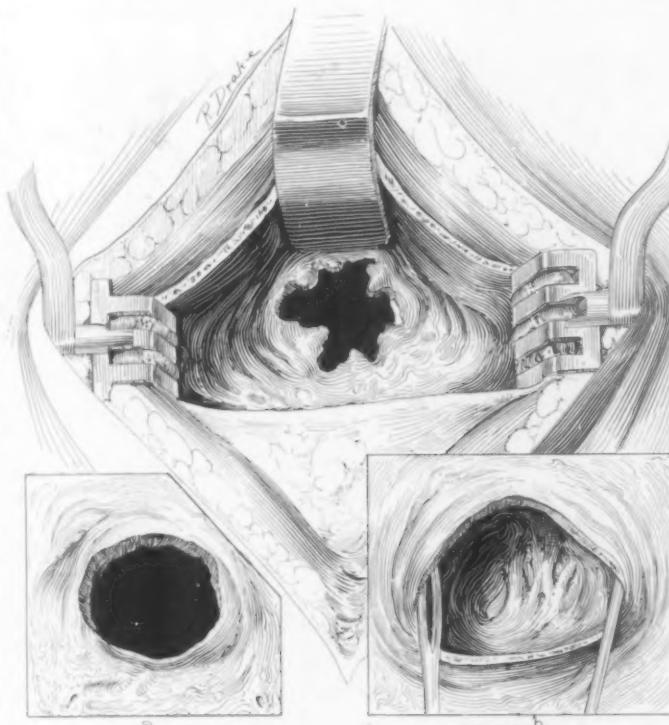


FIG. 5.—Large figure shows irregular neck of bladder following blunt dissection at vesical neck. a. Vesical neck resulting after visible incision (Fig. 3). b. Interior of prostatic capsule.

four months; control was eventually totally restored, except in two instances in which it has been permanent. However, in neither of these cases, after reexamination, has the possibility of a lesion of the cord been excluded. Utilizing the urethral tube for traction requires extreme force, by virtue of its elasticity, to maintain the bag in position, and as traction is made on the urethral tube its force is exerted as a pull directly at the apex of the bag and against the external sphincter. In this way subsequent sphincter control is jeopardized. To obviate elastic traction and the exertion of its force as a pull on the apex of the bag and directly against the external sphincter, a heavy silk strand (Fig. 8) is threaded through the urethral tube and attached to the

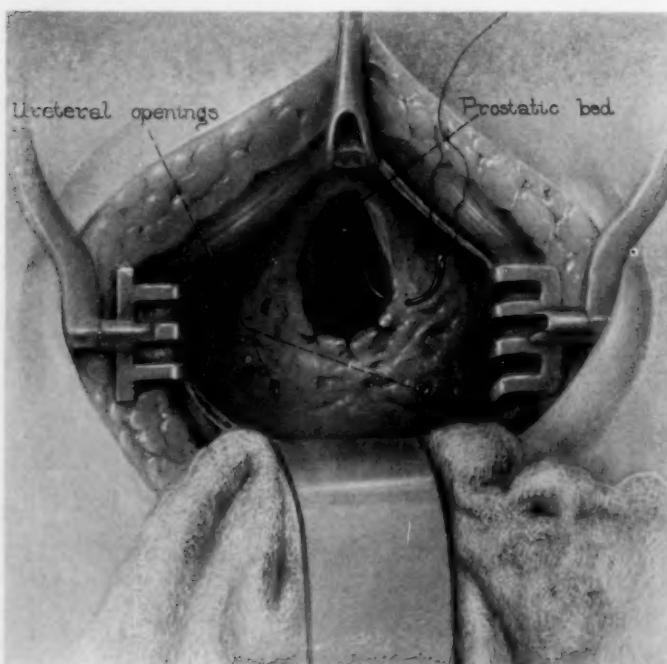


FIG. 6.—Interrupted suture haemostasis at neck of bladder.

ring in the base of the bag. Only sufficient traction is made on the strand to draw it tight, traction being exerted on the base of the bag instead of its apex so that its effect is converted into intravesical pressure on the base of the bag. Since in approximately 75 per cent. of the cases of surgical benign prostatic hypertrophy there is intravesical enlargement with

resultant dilatation of the internal sphincter, I hardly believe that allowing the bag to impinge on the internal sphincter and exerting pressure on it to maintain the position of the bag adds materially to the risk of subsequent failure of function of the internal sphincter. Conservation of the external sphincter is most important in the operation of prostatectomy. Exerting traction in this manner does not jeopardize the subsequent function of the external sphincter, provides inelastic traction, allows no variation of the position of the bag as a result of tenesmus, and accomplishes the maximal haemostatic effect in the prostatic capsule and vesical neck.

The urethral tube extends through the bag but serves a better purpose for the passage of a thread to maintain traction than for drainage of the bladder while the bag is in place. Consequently it is necessary to provide suprapubic

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drainage during this time. This is best accomplished by means of the ordinary No. 30 male catheter and accurately closing the bladder around it. Besides providing drainage the catheter leaves a sufficiently large opening, after its removal, for the withdrawal of the collapsed bag.

It is not necessary to maintain prolonged suprapubic drainage when haemostasis has been accurate. It prolongs unnecessarily healing of the wound

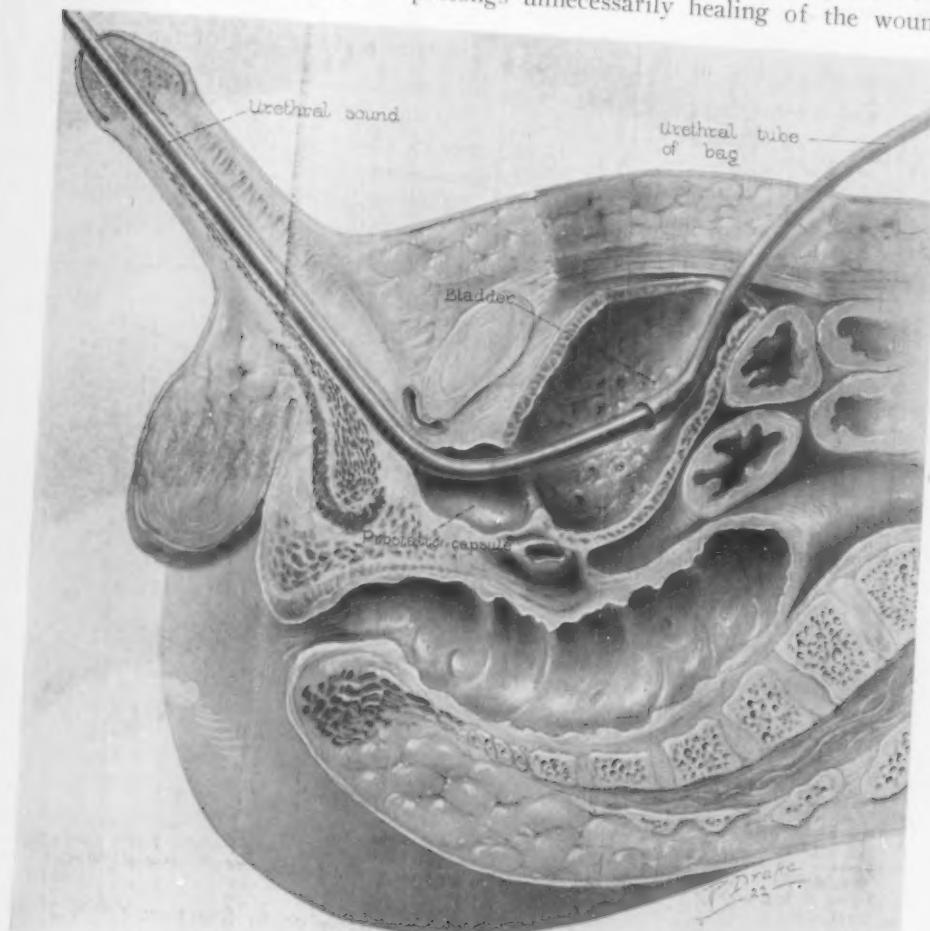


FIG. 7.—Sagittal section after enucleation of the prostate showing method of introducing bag.

and delays the establishment of urethral urinary drainage. It is necessary for urinary drainage only so long as the bag is in place. Considerable difference of opinion exists regarding the length of time the bag is required. In most instances six hours is probably long enough, and little reason may be presented for prolonging the time beyond twelve hours. However, on my own service it has been more convenient not to release the water from the bag and relieve traction under sixteen hours after operation. The bag is allowed to remain deflated for a few hours and careful observations for bleeding are

continued for several hours. In about 4 per cent. of cases reinflation of the bag is necessary; in the remainder the suprapubic tube and bag are all removed within twenty-four hours after operation. Preceding the removal of the bag, a No. 16 male catheter is attached to the urethral tube of the bag and drawn into the bladder as the bag is withdrawn suprapublically. Providing haemostasis has been accurate, continued suprapubic drainage serves no purpose, and urethral drainage of the bladder, after removal of the bag, obviates suprapubic urinary drainage and favors early healing of the wound.

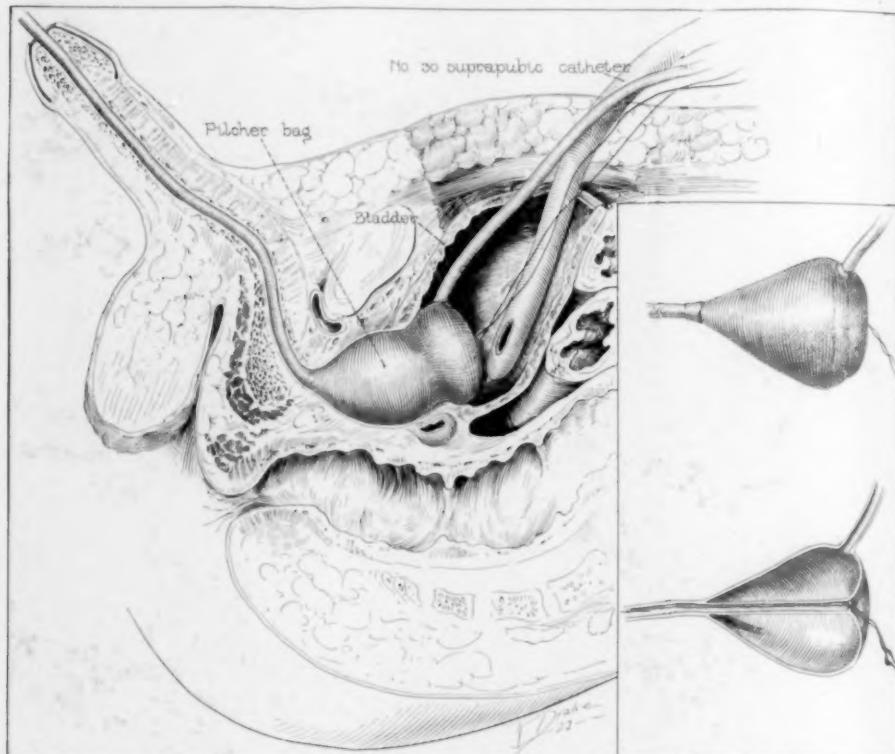


FIG. 8.—Sagittal section with Pilcher bag distended impinging on vesical neck. Insert shows construction of bag and means of providing traction on base of bag by silk strand threaded through the urethral tube.

The urethral catheter is maintained for from twelve to fourteen days, after which voluntary urethral urination is in most cases restored without suprapubic leakage.

Results of the Use of the Pilcher Bag.—From January 1, 1921, to December 1, 1925, suprapubic prostatectomy has been performed in 1020 cases at the Mayo Clinic. The Pilcher bag was used in 702 cases and iodoform gauze packs with or without thromboplastic substances, chiefly cephalin, in the remainder. A careful review has been made of the post-operative course of these patients; it has been possible to make some comparison between cases in which the bag was used and those in which other methods of haemostasis were employed.

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According to my experience the Pilcher bag accomplishes complete haemostasis, as evidenced in most instances by clear urine at all times after operation, and the persistence of clear urine after removal of the bag within twenty-four hours, except in about 4 per cent. of cases, in which temporary reinflation was necessary. A gauze pack, on the other hand, while usually quite adequate for controlling bleeding, allows a variable amount of blood to ooze into the urine for several days, and often after the pack has occupied the prostatic capsule for several days its removal precipitates bleeding of different amounts, at times to the extent of severe hemorrhage. The bag, in its deflation, simply drops away from the prostatic capsule and has no tendency to precipitate bleeding. Secondary hemorrhage, after the bag had been used, occurred from the fifth to the ninth day in but seven cases, one of which was after partial prostatectomy for carcinoma.

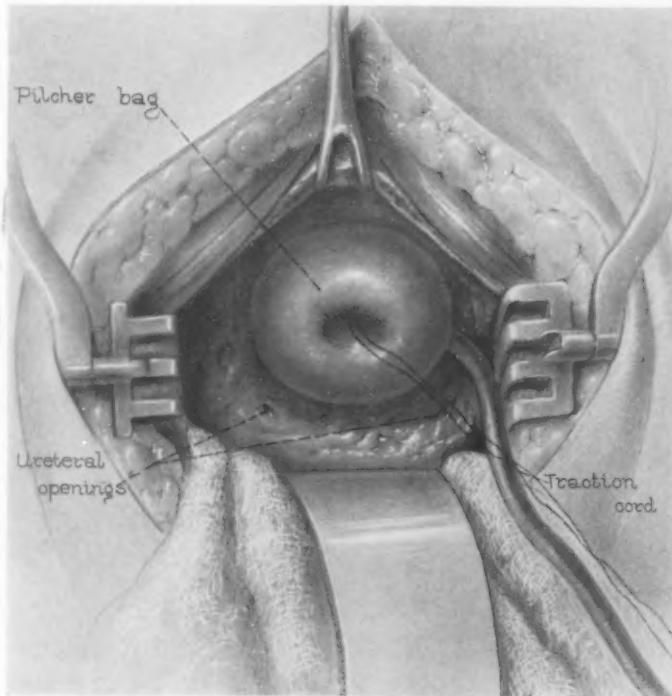


FIG. 9.—Suprapubic view of bag inflated and impinging on vesical neck.

As a result of the early removal of the suprapubic drain, with early institution of drainage of the bladder by urethral catheter, made possible by the Pilcher method of haemostasis, 75 per cent. of the wounds healed without suprapubic urinary drainage and they healed earlier. In those cases in which the Pilcher bag was used and the suprapubic tube removed early, healing of the wound occurred on the average in but three-fourths the time required when gauze was used to control bleeding and suprapubic drainage was prolonged.

The physical and organic reserve of the patient with prostatic obstruction should be improved by preliminary treatment to insure safety in operating. As Bugbee has stated, removal of the prostate is but an incident. However, it is a most important incident and requires for its successful accomplishment visible procedure when possible and accurate haemostasis. In my experience

VERNE C. HUNT

the Pilcher bag offers a most effective method of accurate haemostasis after suprapubic prostatectomy.

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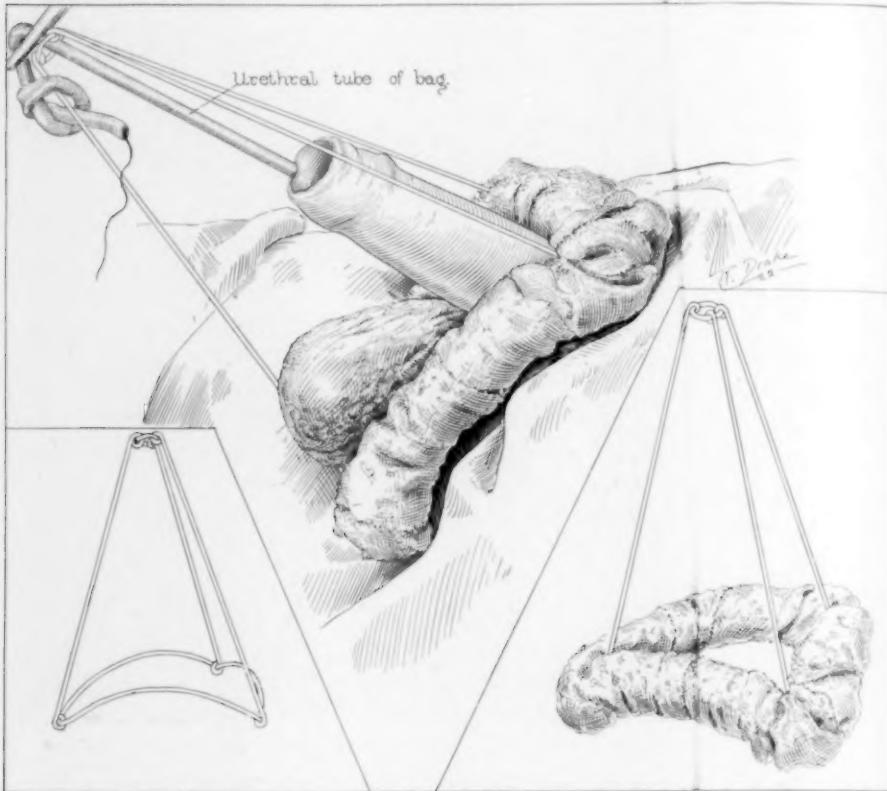


FIG. 10.—Method of maintaining traction over Hamer's perineal tripod. No traction is exerted on the elastic tube of the bag but upon the silk strand threaded through the urethral tube.

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ARTHROTOMY FOR KNEE-JOINT CALCULI*

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THE surgical knee has always been a problem to the surgeon, and no other joint has received so much attention or been subject to more controversy from a diagnostic and therapeutic standpoint. The ordinary injuries such as

synovitis, patella and articular fractures, foreign bodies and the septic knee—all of these, common as they are, are not standardized as to treatment, perhaps excepting patella fractures. The controversy as to mobilization *versus* immobilization in reality centres about the knee, and this despite a war and post-war experience of much magnitude.

If these common injuries are still the subject of wide differences of opinion among competent surgeons, it is not surprising that the diagnosis and treatment of intra-articular loose bodies is still more controversial. The problem is one of the oldest in joint surgery, and we are told that Ambrose Paré successfully removed a loose body from the knee in 1558, and Annandale in 1877 sutured a meniscus. Hey in 1784 used the term "internal derangement of the knee," and since then the surgical literature of England, France, Germany, Italy abounding refers to this topic, the invading bodies being denominated by a variety of terms such as "loose bodies," "rice bodies," "joint mice," "joint concretions," and others more or less descriptive.

In our own country, until recently at least, intra-articular invasion of this sort has received rather scant attention, sur-

prising in view of the writings of Sir Robert Jones and Rutherford Morrison, who have probably removed more such invaders from the knee than have been reported by all the surgeons in America. This suggests that if English

* Read before the New York Surgical Society, November 25, 1925. From the Department of Traumatic Surgery, New York Post-Graduate Medical School and Hospital.

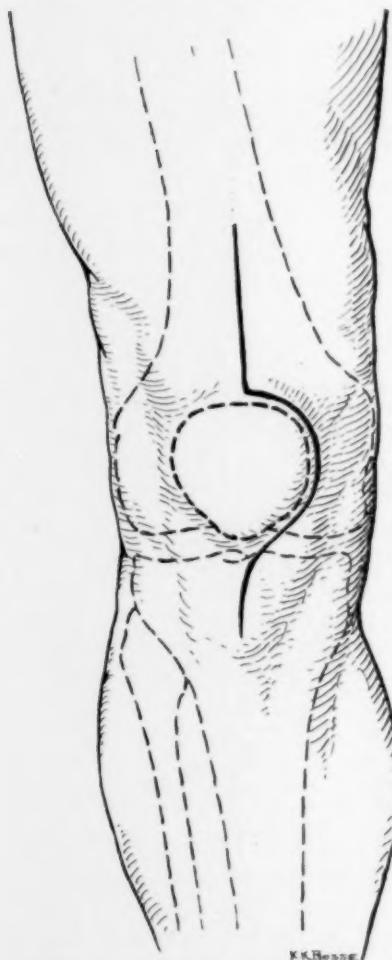


FIG. 1.—Medio-lateral arthrotomy skin incision.

ARTHROTOMY FOR KNEE-JOINT CALCULI

and some continental surgeons call thrombo-angiitis-obliterans "the American disease," we might aptly call knee meniscus disturbance "the English disease."

Without any preliminary statements as to the anatomy of the knee-joint, it is the object of the writer to record his observations on forty-nine cases in which arthrotomy was performed to remove arthroliths which had been the

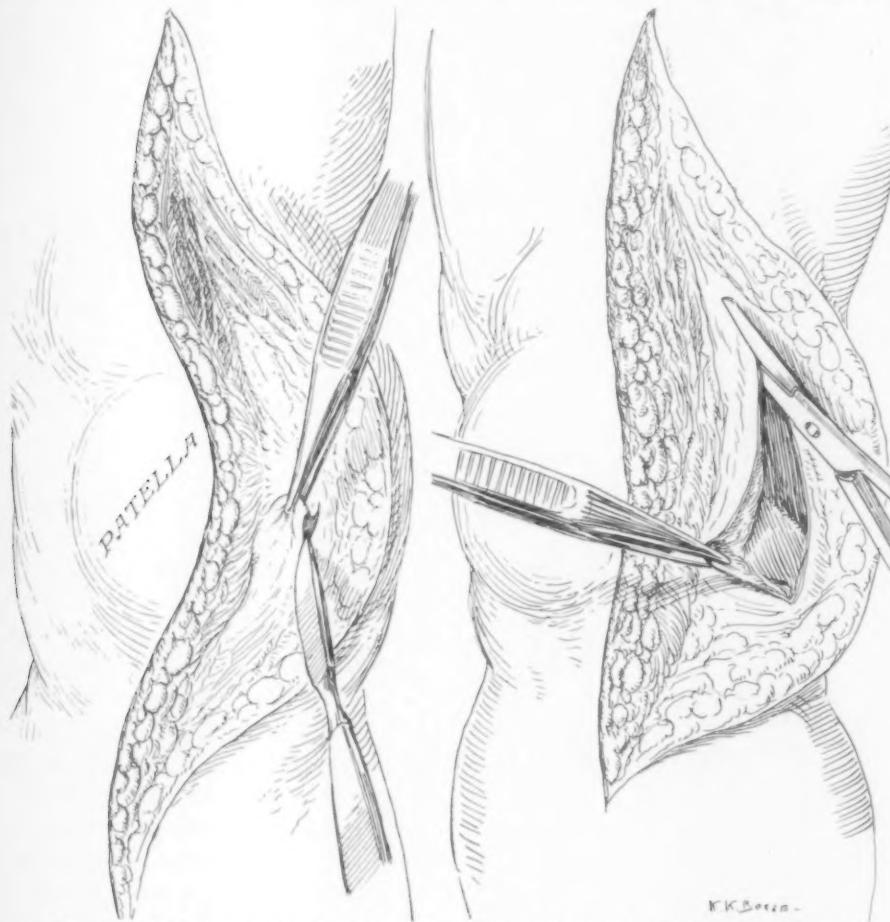


FIG. 2.—Incising capsule at lower end of wound.

FIG. 3.—Capsule being incised along line of skin incision.

source of knee dysfunction extending, in many cases, over a period of several years.

From a clinical standpoint this review readily assembles itself into three groups of cases, namely, the *acute*, *subacute* (or *recurrent*) and *chronic*.

Acute Group.—In these the onset is usually sudden, and in most cases is ascribed to indirect trauma, such as twisting violence, as is best represented by a football player tackled and thrown while running, or sustaining the injury in a scrimmage. Tennis, hockey, baseball, skiing, golf, skating and other similar activities furnish additional members of this group, variously termed "football knee" or "athlete's knee." Certain occupations apparently

are prone to this condition, and indeed in England it is known as the "Miner's knee," for it occurs often when the patient is at work with the knee more or less bent, violence then twisting or rotating the joint, as in an effort to straighten up from a crouching position. Much has been written as to the exact mechanism by which the joint invader becomes

detached, and the majority of writers assert that version or rotation of the thigh is a prerequisite. However, others of equal experience assert that version or rotation of the tibia is the essential element.

It seems fruitless to debate these factors at length, for in the end we would not reach any firmer agreement than now obtains, for example, as to the mechanism by which Colles' fracture occurs.

This acute group is best represented by relatively young people, and most of them are between sixteen and twenty-five years of age.

The usual history is that while walking, working or playing a sudden wrench of the knee took place, and this was immediately followed by pain, swelling, and more or less disability. The patient often falls, and in some cases contact with the ground is more accused than the preliminary twist or wrench. The joint is found to be partly bent in a number of cases, and at all events in some of them a cer-

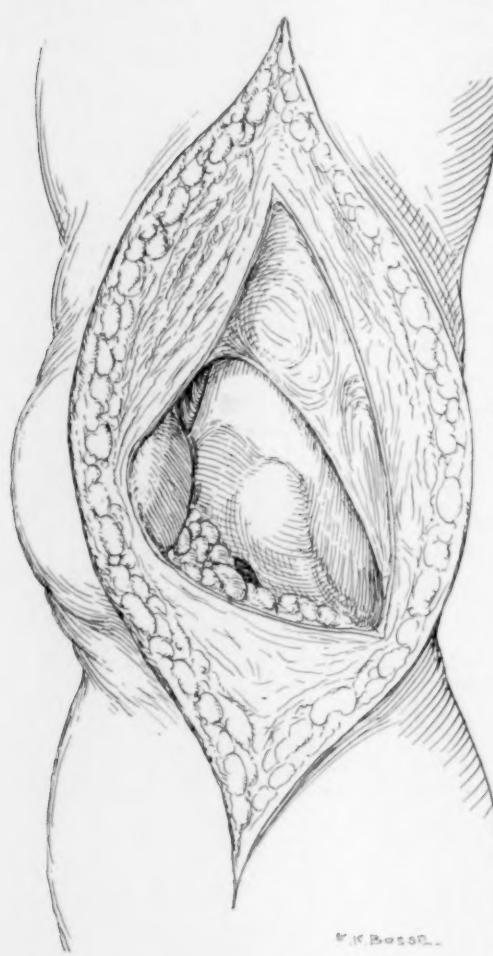


FIG. 4.—Patella retracted showing antero-lateral portion of joint.

tain amount of manipulation is required before it can be straightened. If it occurs in football, massage and adhesive tape may permit continuance of the game, but in such instances and in all others, joint swelling promptly appears. This may be localized and assume the appearance of a bursitis or limited synovitis, but in the majority the outstanding features, next to pain, are synovitis and limitation of function. As a matter of fact most of these patients are regarded by the profession and laity alike as suffering from "water on the knee."

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If such effusion has occurred, the exact diagnosis may be masked or missed unless localized tenderness can be elicited, or a calculus can be palpated, or, more rarely, X-ray examination discloses the actual traumatology. If the effusion is promptly aspirated, as it should be, pressure over the head of the tibia with the knee flexed, may elicit tenderness over the inner or outer meniscus, and this may be corroborated by obtaining pain in the same location by rotating the tibia, inasmuch as the cartilages move with this bone. (Fig. 11.) Incidentally it is pertinent to say that the effusion of acute traumatic synovitis is practically always sero-sanguineous, and I have known it to remain so as long as six weeks after the initiating trauma.

X-ray examination is usually not helpful, even if made after injecting the joint with oxygen or other gases. (Fig. 14.) We tried this procedure many times, and sometimes felt that obscure cases were better evaluated thereby; however, we have abandoned this diagnostic aid, instead relying upon the history and the findings, of which more will be stated later.

Many variations

as to the extent of symptoms obviously occur, and all grades are encountered from minor pain, joint limitation and effusion to extreme manifestations with ensuing disability. Many persons have had single attacks of this sort without any recurrence whatever, but the rule is that one attack predisposes to another, and thus they pass into the subacute or recurrent group. It is my belief that the initial injury often fractures a meniscus or partly detaches it, and that a second injury actually separates or dislocates it.

If this latter ensues, blocking of the joint may occur, giving rise to the so-called "locking of the joint," which is so characteristic of semi-lunar

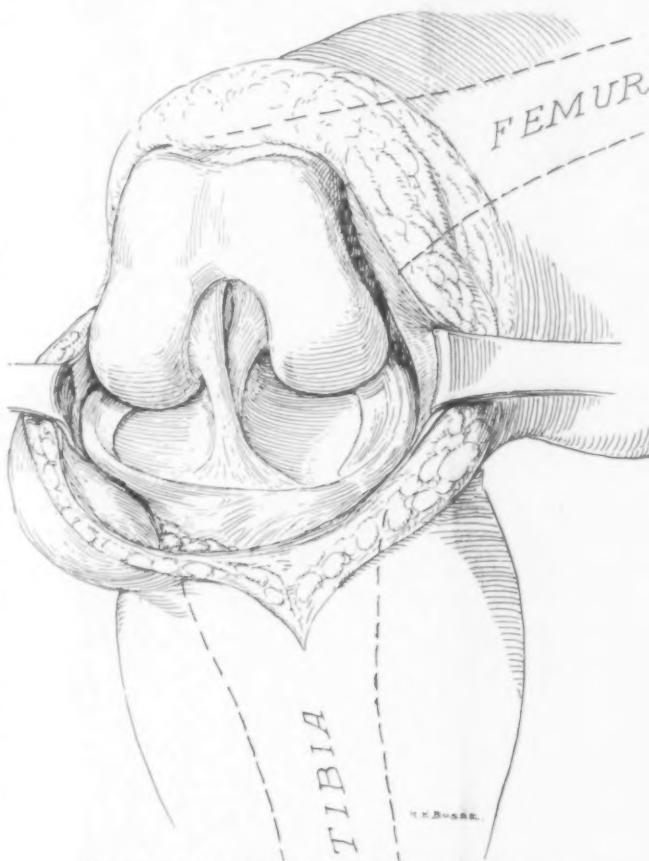


FIG. 5.—Knee hyperflexed with patella retracted, exposing semi-lunars and crucials.

injury but which may occur with other forms of calculi, but usually to a lesser extent.

The analogy between knee-joint traumatology and abdominal pathology tempts a surgeon to parallel the lesions common to these respective cavities.

The term "calculus" which is herein used was employed because of their symptomatic resemblance to gall-bladder, kidney, ureter and urinary bladder "loose bodies" or calculi. In the abdomen these may remain wholly quiescent or silent,

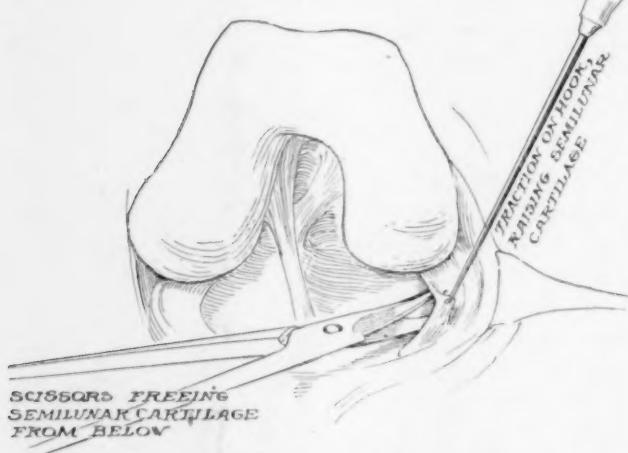


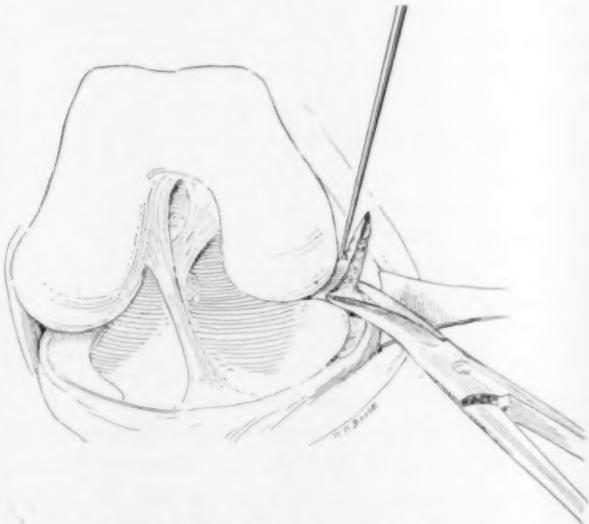
FIG. 6.—Beginning excision of internal semi-lunar.

and at times they may become activated by a variety of more or less well authenticated causes.

By analogy, these bodies in the knee may remain silently quiescent unless aroused into activity by trauma or a distant infection. The so-called indigestion due to gallstones may well be likened to the similar conditions occurring in the knee, and either cavity, under adequate provocation, is subject to attacks of colic. The analogy is helpful and suggestive if, further, we regard this process in the knee as demanding surgery rather than physiotherapy, braces or antirheumatics.

Subacute and Recurrent Group.—These are the cases in which prior attacks of joint disability have occurred, either as the direct result of repeated trauma, or by metastasis from a distant focus. Some of these patients have

FIG. 7.—Excising posterior attachment of internal semi-lunar.



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had many attacks of "joint colic," the knee has been uncertain for months, perhaps it has required some sort of knee-cap, mesh bandage or other support when called upon to perform any unusual act. These are the cases of so-called "recurrent synovitis," or "mono-articular arthritis," or "articular neuritis," or "weak knee." They all give a history of a distant initial seizure, a quiescent interval period, and then a recurrence ascribed to some definite or indefinite factor. Each succeeding outbreak of temporary pain, synovitis and



FIG. 8.—Capsule sutured. Deep fascia and part of vastus internus being sutured.

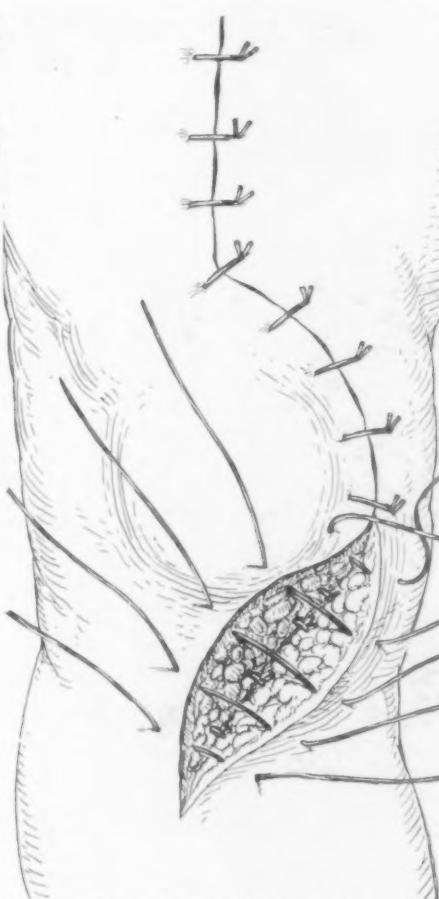


FIG. 9.—Skin and superficial fascia being sutured.

joint limitation may mimic in all respects the preceding attacks, and here again cholelithiasis and nephrolithiasis are by analogy called to mind.

Examination in this group, in addition to the cardinal trinity of signs (pain, swelling and limitation), will show atrophy of the quadriceps group and, usually, a laxity of the knee-joint capsule amounting sometimes to actual insecurity or instability. Such a patient will often volunteer some such statement as "I am not sure of my knee," or "My knee lets me down," or "My knee goes out on me." Local pain is often present; crepitus exists; the

calculus may be seen or felt, or both; the X-ray examination will show periarthritis, perhaps visualize the calculus, perhaps show signs of osteo-arthritis or villous synovitis.

This group of patients is older in years, upwards of twenty-five, and certainly older in articular experience. Invasion of the joint by the products of inflammation or distant infection are superadded to the articular trauma, and some of them indeed give no history whatever of violence adequate to the pathology.

These, then, are a mixed group as to etiology, in that they may be: (1) wholly traumatic; (2) traumatic and inflammatory; (3) inflammatory; (4) disease processes.

Chronic Group.—If inflammatory or due to infection, these are examples of arthritis, registering as a mono-arthrosis of the knee, or, as is more usual, affecting this joint more than others. If due to disease, we accuse *syphilis*, tuberculosis, osteochondritis *sicca*, osteochondritis *dessicans*. Some neuropathy, or factors unknown or undetermined, may enter into the picture. At all events the destructive process is advanced enough to make the damaged knee an object and subject of



FIG. 10.—Incisions for median arthrotomy, medio-lateral arthrotomy, lateral arthrotomy.

comment, for it is obviously distorted, it creaks, it does not move fully, the adjacent muscles are wasted, calculi are often visible or palpable, and X-ray examination shows more or less gross deformation with probably visible arthroliths.

These, then, are the usual clinical classifications, and they might with equal facility be called *primary*, *intermediate* and *late* groups; but whatever their allotment, they all present a relatively constant surgical pathology.

Surgical Pathology.—The *acute* or *primary* group usually shows:

1. Fracture or fracture-dislocation of a meniscus. The internal semilunar is involved in by far the greater proportion.

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2. Sprain-fracture or chip fracture of the contiguous femur, tibia or patella. The very rare cases of fractured tibial spine and ruptured crucial ligaments are in this category also.

3. Subpatella fat pads are hypertrophied or fused into a mass known as lipoma arborescens.

4. Villous synovitis.

5. Bands, adhesions, cysts.

The Subacute (Recurrent) or Intermediate Group:

1, 2, 3, 4, 5 of the preceding.

6. Synovial excrescences not unlike adenoids in appearance.

7. Exostoses or enchondromata.

The Chronic or Late Group:

1, 2, 3, 4, 5, 6, 7 of the preceding.

8. Hypertrophic osteo-arthritis.

9. Joint irregularities.

Treatment—Acute or Primary Group.—If the joint is bent or locked, it should be straightened by manipulation, with or without anaesthesia. There are two procedures, the one advised by Sir Robert Jones being satisfactory in the majority of cases, and in this the knee is bent, and abducted fully, and when thus manipulated, the surgeon places his finger over the meniscus and directs the patient to forcibly kick the knee straight, or the surgeon himself quickly forces it straight. The other method is to forcibly bend, abduct and drag down the knee, and while thus in traction suddenly extend the limb. If after repeated vain trials of either or both methods, it is needful to give an anaesthetic and then by flexion, rotation and extension force the invader into position. Relief of pain and return of extension are the signs of successful reduction.

Joint effusion should then be removed by aspiration. The joint is thereafter placed on a light posterior splint and a wet dressing is applied. Massage and external heat are used daily, and when pain on pressure subsides, and when banging on the heel causes no acute tenderness, the patient is allowed to walk, a light posterior splint being worn to prevent flexion. Passive motion begins when rather active massage causes no continued reaction, and soon thereafter guarded active motion is allowed. If football or other games are regarded as essentials by these patients, then suitable guards are to be used. Overbending or rotation of the unsupported knee should be proscribed for several months.

The Subacute (Recurrent) or Intermediate Group.—Here the process eventuates into a synovitis, usually localized, and treatment is either by (a) aspiration, followed by immediate mobilization; or (b) rest with pressure immobilization on a posterior splint. Many of these patients habitually wear some form of knee support, usually a mesh or semielastic knee-cap, and in these quadriceps atrophy is a feature, and hence this group benefits from massage and radiant heat, both of which stimulate the weakened muscles and promote absorption of the joint exudate.

The Chronic Group.—Actual deformation of joint structures is usually present, so that treatment aims to preserve the musculature and absorb joint effusion. Physiotherapy is the best treatment for the local condition, and in this group especially it is needful to carefully investigate any possible source of distant infection, such as the oral and adjacent cavities, the appendix, the gall-bladder and the urogenital system.

Operative Indications.—Very rarely will the surgeon be called upon to operate for an initial attack, and, hence, arthrotomy becomes the chosen method only when the process has recurred often enough to make the joint unsafe for ordinary pursuits. Recurrent attacks of pain, effusion and joint



FIG. 11.—Eliciting local tenderness on palpation, internal semi-lunar regions.

limitations eventuate into muscular atrophy and more or less joint deformity; any combination of these justifies surgical relief. Cartilage in the knee, as elsewhere, rarely heals smoothly; for example, the "cauliflower ear," the nasal septum.

The Operation.—Arthrotomy may be said to be *limited* when performed through a small exposure, as for the removal of a meniscus or a localized arthrolith or exostosis. Arthrotomy may be said to be *general* when performed through a large exposure, as for the removal of hypertrophied fat pads, multiple arthroliths, multiple exostoses, villous synovitis, or damage to the tibial spine, crucial ligaments, or for chip fractures of the intra-articular bony prominences. (Fig. 10.)

Here, again, the analogy between laparotomy and arthrotomy is sug-

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gestive, and indeed the joint surgeon, like the abdominal surgeon, more and more prefers wide incision to limited incision, except when the indications are clinically and classically localized. In acute cases definitely appendicular, a relatively small incision still suffices; but in subacute and chronic cases the prudent surgeon explores not only the lower but also the upper abdomen. The parallel holds precisely for the knee cavity, and here the appendix of the joint may well be said to be the internal meniscus.

Semilunar Excision.—A vertical approach is satisfactory and is customary, although many surgeons incise in a crescentic manner, and others prefer a U-shaped approach. Whatever the type of incision, it is essential that the knee be placed at a right angle, so that the supratibial joint space is as wide as possible. This is accomplished by hanging the legs over the end of the table after the plan suggested by Jones. This requires a seated position on the part of the operator, and it also means that the operating table has to be elevated before suturing in three layers is begun. To obviate these features, sometimes embarrassing if redraping the field is required, we now place the patient supine and fully bend the knee to be operated upon, resting the foot against the opposite thigh, the latter braced by a sandbag. (Fig. 12.)

We believe that we can thus better visualize our field, and feel also that we are less likely to disturb the draping of the parts. The matter of employing the ultra-aseptic hands-off or Lane technic is a matter for individual judgment, but in our cases of arthrotomy we have rigorously followed this method from the beginning of the preparation for the operation until the gauze dressings are placed. The suture nurse handles all the material with sponge holders, and the sutures are previously cut six inches long and threaded through a large rubber tube, so that one by one they may be withdrawn by the second assistant. Each instrument before being re-used is thrown into a basin of very hot saline, and this solution is changed every fifteen minutes during the course of the opera-



FIG. 12.—Obtaining right-angled flexion by placing foot against opposite thigh obviating hanging leg over end of table.

tion. All instruments are passed to the operator and his assistant by clamps, and all sutures are inserted by a Reverdin needle-holder, and are tied by clamps. No tourniquet is used. Perfect haemostasis is aimed at and is usually obtained by suturing the separate layers without resort to ligature.

It is almost impossible to remove the entire cartilage, except when it is much frayed, or of the two-piece or so-called "bucket handle" type. The anterolateral portion is the part usually involved, and this is excised in one or two segments. A narrow-bladed knife is essential, and rotation of the knee will often bring into view a hidden or posterolateral segment. Normally, the

cartilage is about as thick as a dollar, but in advanced cases it may be as thin as a dime. In a number of our cases the pathologist found little, if any, cartilage, and almost total replacement by fibrous tissue. We place a wet dressing of iodin saline solution (iodin one dram to normal saline one pint) over the wound, and cover this by dry gauze, a layer of cotton, and then bandage in such a position that right-angled motion is possible. No splintage has been used. We insist on immediate motion every two hours, to and from a right angle twice, this to begin when the patient is out of the anaesthetic. This is most painful during the first

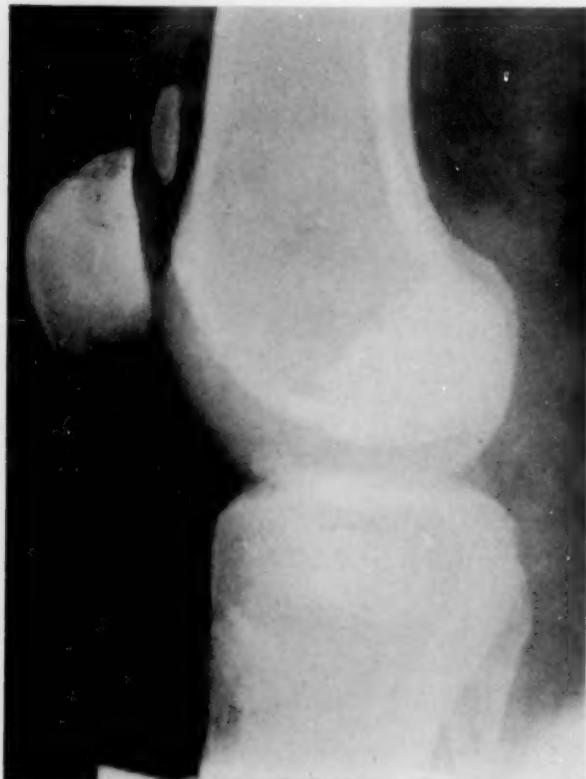


FIG. 13.—Knee-joint calculus.

two days, but thereafter is usually relatively painless. In patients who decline to co-operate, we permit the use of a pillow, which is gradually forced higher and higher under the knee, and gradually lowered therefrom after the desired height is obtained. In others, we pass a sling under the knee and attach a cord thereto, and this passes to a pulley in an overhead frame, so that raising and lowering of the joint is thereby obtained. We insist that shrugging or contraction of the quadriceps begin at once, so that there is early return of ability to lift the heel off the bed with the knee straight. We do not aspirate for post-operative effusion, and indeed this does not long persist if early motion is accomplished. On the

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third or fourth day the patient bends the knee over the side of the bed, and on the fifth, sixth or seventh day he is permitted to walk. Stitches are removed on the seventh day. No knee-cap is worn. Electric light or sun-light exposure is used after the fifth day if joint swelling or tenderness appear to be unusual. We regard this form of after-treatment as essential, and believe that the first two post-operative days are the most important, in that motion then attained is retained, so that post-operative trauma will not result in a grade of stiffness that may require weeks of physiotherapy before it is overcome.

Intra-articular Approach: Exploratory Arthrotomy.—For the subacute (recurrent) and chronic groups, a limited or low arthrotomy often will not suffice because the marginal and superior portions of the joint are frequently coincidentally affected. The analogy suggested is that of acute appendicitis or acute cholecystitis in which a limited or regional exposure is satisfactory; but in recurrent or long-standing intra-abdominal affections prudence dictates the more radical exploratory laparotomy.

Four procedures are in vogue for this purpose:



FIG. 14.—Air injected joint showing dislocated semi-lunar.

1. *Bilateral incision* at either margin of the patella.

2. *U-shaped incision* with division of the patella tendon.

We have not used either of these, and do not regard them as advisable or needful.

3. *The patella-split or median arthrotomy*, known variously as the Ollier incision (arthrotomie trans-rotulienne), or the Jones incision (vertical trans-patella). In this the skin incision begins above the summit of the middle of the patella, and passes straight downward to end at the tibial tubercle. (Fig. 10.) The patella is sawed completely, or it is sawed partly, and then split by a chisel. If now the bisected patella is retracted, adequate joint

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TABLE I.
List of Cases—(M = Median—L = Lateral—ML = Medio-lateral)

No.	Name	Age Sex	Cause	Arth- rotomy	Findings	Operation	Days In bed	In hos- pital	Remarks
1.	L. D. A.	67 F	Gradual onset	M	Calculi; arthro-synovitis	2-9-19			Bilateral process osteo-arthritis.
2.	V. B.	M	Injury	M	Calculi; hypert. synovitis	2-2-20			
3.	H. M.	34 F	Fell on stairs	M	Fract. int. semi-lunar; villous synovitis	2-28-20	7	11	Arthritis in other joints.
4.	B. V. M.	44 M	Kicked by horse	M	Fract. int. semi-lunar; arthro-synovitis	5-15-20	5	15	Policeman—original injury 12 years prior to operation.
5.	A. S.	19 M	Wrenched knee	L	Dislocated int. semi-lunar	3-8-21	3	6	
6.	M. G.	20 M	Wrenched knee	M	Dislocated int. semi-lunar	6-16-21	3	8	
7.	L. M.	26 M	Wrenched knee	M	Dislocated int. semi-lunar; arthroliths	6-23-21	3	6	
8.	M.M.	22 F	Jumping from tree	M	Fractured int. semi-lunar; villous synovitis	12-2-21	3	16	Prior operation. Wore brace for years. Limb much atrophied. Knee excessively mobile. Intra-articular reefing of capsule.
9.	M. W.	24 F	Fell skating	M	Fracture-dislocation int. semi-lunar; villous synovitis	2-2-22	4	8	Hospital nurse. Resumed duties. Knee excellent, Oct., 1925.
10.	D. H.	27 F	Dancing	M	Int. semi-lunar fractured; hypert. synovitis	2-27-22			
11.	M. F.	51 F	Gradual onset	M	Villous synovitis; arthroliths	3-20-22	8	41	Arthritis in other joints. Referred to medical consultant for colitis.
12.	N. D.	34 F	Fell	M	Fractured int. semi-lunar; villous synovitis; bony arthrolith	4-4-22	7	9	General health poor. Knee in excellent condition Oct., 1925.

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13.	W. M.	23 M	Wrenched knee	M	Fracture-dislocation int. semi-lunar	4-12-22	4	6
14.	E. B.	32 M	Infection, trauma	No	Calculi; arthro-synovitis	4-20-22	4	19
15.	J. S.	23 M	Wrenched knee	M	Fracture-dislocation int. semi-lunar; villous synovitis	5-1-22	6	8
16.	D. C.	23 M	Infection wrenched knee	M	Arthroliths; villous synovitis	5-5-22	3	8
17.	G. H.	24 M	Basket ball	M	Dislocated int. semi-lunar; villous synovitis; membranous bands	6-8-22	6	22
18.	E. E.	25 F	Blow on knee	M	Villous synovitis; hypert. fat pads. Membranous bands	6-9-22	6	8
19.	E. O.	26 M	War injury; fell	L	Fracture int. semi-lunar	6-10-22	3	8
20.	F. H.	29 M	War injury; fell	M	Dislocated int. semi-lunar	9-19-22	4	16
21.	E. A.	28 M	Russian dancing	M	Dislocated int. semi-lunar	9-26-22	3	11
22.	H. B.	26 F	Gradual onset	M	Hypert. synovitis	12-20-22	7	11
23.	C. J.	23 M	?	L	Int. semi-lunar fractured	1-22-23		
24.	F. S.	59 M	Fell; infection	M	Dislocated int. semi-lunar; hypert. osteo-arthritis	5-8-23	6	14
25.	B. K.	23 M	Wrenched knee	M	Dislocated int. semi-lunar	6-29-23	3	13
26.	R. S.	25 M	Fall	M	Int. semi-lunar fractured; hypert. fat pads	7-2-23	6	12

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TABLE I.—Continued
List of Cases—(M = Median—L = Lateral—ML = Medio-lateral)

No.	Name	Age Sex	Cause	Arth- rotomy	Findings	Days		Remarks
						Operation	In bed	
27.	L. M.	26 F	Wrenched knee	M L	Fractured int. semi-lunar	10-1-23	8	11
28.	L. S.	24 M	Wrenched knee	L	Int. semi-lunar fractured	10-27-23	7	9
29.	I. D.	40 F	Wrenched knee	M L	Dislocated int. semi-lunar	11-8-23	4	9
30.	LeG. S.	18 M	Football	M L	Fractured int. semi-lunar; ac. synovitis	12-3-23	4	18
31.	J. B.	42 M	Gradual onset	M L	Fractured int. semi-lunar; hypert. fat pads	1-14-24	4	12
32.	G. H. B.	38 M	Wrenched knee	M L	Fractured int. semi-lunar	2-21-24		12
33.	E. K.	39 M	Struck knee?	M L	Fracture int. semi-lunar; hypert. fat pads and synovitis	3-20-24	4	19
34.	J. R.	65 F	Gradual onset	M L	Calculi; Hypert. synovitis	3-24-24 3-21-24	4 5	19
35.	K. R.	29 M	Playing base- ball	M L	Dislocated ext. semi-lunar; hypert. fat pads	5-19-24	7	15
36.	G. O.	48 M	Wrenched knee	M L	Fracture int. semi-lunar; hypert. fat pads	10-2-24	4	13

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37.	H. C. M.	20 M	Basketball	L	Int. semi-lunar dislocated	11-10-24	5	9	Returned 11-4-25 with synovitis due to recent injury. Knee active since operation.
38.	H. W.	9 M	Baseball	M L	Int. semi-lunar dislocated; hypert. synovitis	12-26-24	6	12	Previous aspiration 12-4-24. No tuberculosis. Knee excellent, Nov., 1925.
39.	W. S. P.	24 M	Football	L	Fracture int. semi-lunar	1-5-25	4	16	Repeated attacks of locking. College hockey star. Knee excellent, May, 1925.
40.	M. H.	27 M	Wrenched knee	M L	Calculus; hypert. synovitis	2-9-25	7	15	Still complains of pain and limitation. June, 1925.
41.	P. F.	24 M	Football	L	Fracture int. semi-lunar	2-12-25		10	Reports knee excellent, Oct., 1925. Rugby football player.
42.	E. L. B.	50 F	Wrenched knee	M L	Dislocated int. semi-lunar; hypert. synovitis	2-16-25	5	11	Still complains of pain and limitation. Arthritis present in other joints.
43.	J. M.	37 M	Blow, wrenched knee	L	Int. semi-lunar fracture-dislocation	3-20-25	5	11	Ex-British soldier. Soccer player. Prior injuries. Still has occasional pain. Knee active.
44.	J. S.	38 F	Gradual onset	M L	Hypert. synovitis	5-21-25	4	10	
45.	H. L. F.	20 M		L	Fracture-dislocation int. semi-lunar	12-21-24	4	9	College athlete. Knee excellent, Sept., 1925.
46.	W. A. F.	30 M	Wrenched knee	L	Int. semi-lunar fracture-dislocation	4-16-25	4	8	Repeated attacks of knee locking. Knee excellent.
47.	C. W.	39 M	Wrenched knee	L	Fracture-dislocation int. semi-lunar	6-12-25	5	8	Repeated attacks of locking. Arthritis in other joints.
48.	S. S. T.	21 M	Football	L	Fracture-dislocation int. semi-lunar	9-21-25	5	9	Excel. function, Nov. 10, 1925.
49.	G. J. S.	39 M	Gradual onset	M L	Int. semi-lunar fracture-dislocation. Fat pads hypert.	11-9-25	5	7	

exposure is attained, especially if the joint is flexed. In villous synovitis especially, this procedure is very valuable, and if need be, complete synovectomy can be accomplished. In passing it is interesting and important to know that Key has recently shown † that in rabbits, after complete synovectomy, there is a replacement of the synovial lining in sixty days.

Closure is made in three layers, the innermost coaptting the capsule, the next the deep fascia and the last the skin and subcutaneous tissues. The patella is automatically coapted by these two deeper layers, and requires no drilling or other procedure to accurately and firmly unite it. We have not used a tourniquet and have not varied the after-treatment, insisting on the

same immediate mobilization as in the already-described arthrotomy for meniscus calculi. The only modification is ether lavage, which we employ for more adequate haemostasis and because debris is floated out through a sterile medium which evaporates. All suturing is of the interrupted variety, plain catgut for the deeper layers and silk-worm gut for the external layer. In our series of forty-nine cases we have used this incision twenty-three times.

4. *The medio-lateral incision*, in which the incision begins above the top of the middle of the patella and then passes to within one-

FIG. 15.—Hypertrophic osteoarthritis.

half inch of the knee-pan, and thence passes around half of the latter close to its edge, and thence downward to end at the tibial tubercle. Usually, the lateral half of the incision passes to the inner side of the patella inasmuch as the internal meniscus is often associated with the pathology higher up. (Figs. 1 to 10.) Some of the fibres of the vastus internus are cut, and to that extent this incision is faulty; but this defect is balanced, in that the patella is not split. The exposure is adequate, it involves soft parts only, it is more speedily made. Closure is as in the preceding, and the after-treatment is identical.

† *Journal Bone and Joint Surgery*, vol. vii, No. 4, October, 1925.

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We have performed this operation in fourteen cases, and it has superseded the patella split approach with us since October, 1923.

These, then, are the usual procedures, and for completeness may be added the posterolateral or posteromedian incisions when the rear compartments of the joint are affected. We have not encountered this class of case.

End-results.—After removal of a cartilage, a fat pad or section of villous synovia, is the joint capable of resuming function? Our experience thus far is that the operative relief equals that afforded by comparative procedures in other closed cavities, notably the abdomen. Aside from this we have had recent occasion to check up the football and other squads at certain colleges, and the local surgeons, coaches and trainers are of the opinion that athletics, even of the most radical sort, can be resumed and are resumed by many who have had knee-joint arthrotonies. The failures appear to be in the subacute and chronic cases, and here, as expected, the pathology was too diffuse to be remedied by the mere removal of a foreign body.

All of these patients could not be traced, but we have records of a sufficient number to indicate that relief from symptoms has been very gratifying. There has been no post-operative joint stiffness in any of the group, and so far as is known, joint stability and flexibility has been improved. The outstanding features of this compilation may be said to be the recognition that arthrotomy is a reliable procedure for calculus mono-arthritis, and that general arthrotomy does not contra-indicate speedy return of function.

Number of cases, 49; males, 36; females, 13; oldest, 67; youngest, 9. Lateral arthrotomy, 12; median arthrotomy, 23; medio-lateral arthrotomy, 14.



FIG. 16.—Comminuted fracture, head of tibia with bony calculus in joint.

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CONCLUSIONS

1. The surgical knee is a type of mono-arthritis initiated by trauma, but often activated or aggravated by distant infection.
2. The internal meniscus is more often involved than any of the other structures; next commonest findings are hypertrophied fat pads, villous excrescences, and bone fragments.
3. The cardinal signs are pain, synovitis, joint limitation; to these are often added atrophy, joint instability and crepitus.
4. X-ray examination is of positive value only when the arthroliths are calcified.
5. The history and examination usually present a fairly typical picture, so that the patients fall into three groups (acute, subacute and chronic) as to age in years and age in pathology.
6. Arthrotomy, limited or general, is notably effective in a selected group of patients.
7. After-treatment by active mobilization is an important feature.
8. The ultra-aseptic (Lane) technic has given primary union in this series of forty-nine cases.
9. Arthrotomy does not contraindicate future joint activity, even in athletes, if the articulation has not been too greatly damaged prior to operation.
10. Accumulating experience indicates that *general* arthrotomy is a wiser procedure than *limited* arthrotomy, and hence this latter type of approach should be reserved for early cases, or those in which the diagnosis is relatively certain.
11. The length of incision is no bar to immediate active mobilization, and with any form of approach, the patient can with safety and profit be encouraged to walk within the first week.
12. The analogy between intra-abdominal lesions and intra-articular knee lesions is very striking as to symptoms and treatment.
13. Recurrent synovitis is usually more due to intrinsic than extrinsic causes, and relief therefrom is more certain by surgery than by physiotherapy, apparatus or drugs.

PRIMARY PNEUMOCOCCUS PERITONITIS

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SOME three years ago a series of experimental and clinical data was published, tending to show that primary pneumococcus peritonitis is strictly limited to young girls, and that the source and mode of infection is *via* the external genitalia and Fallopian tubes.¹ Several articles have appeared in the literature since that time, supporting this conclusion.²

In December, 1925, A. H. Montgomery³ reported a case of primary pneumococcus peritonitis occurring in a male infant, age eight weeks, thus showing that the idiopathic form of this disease is not limited to girls, and that the mode and source of infection may be haematogenous or through the intestinal tract, as well as *via* the female genitalia.

I wish to report three recent cases of primary pneumococcus peritonitis, which coincide with Montgomery's findings, inasmuch as in none of them was infection *via* the genitalia possible. These cases are all in adults; one, a woman whose uterus had been amputated some fifteen years ago, and two males. My opinion is that all three cases are primary—though one may possibly question whether Case I is primary or not, since râles were present in the right lung at the time the peritonitis was diagnosed.

CASE I.—Mr. T. S. Age sixty-four years. Admitted September 13, 1924, on account of knife-like pains in his upper abdomen (epigastrium). He had had a hard sore (?chancre) on his penis ten years ago, which disappeared one month later without treatment. For the past few years has had "attacks of indigestion" with discomfort after meals. This "discomfort" (not acute pain) was not relieved by food or alkali, nor did it come at any definite time interval following his meals. His present illness began suddenly September 13, at 1.30 A.M. (six hours before admission), with sharp pains across lower abdomen. The pains were not colicky and not relieved by change in position. Abdomen became very hard. Vomited three times. Bowels moved slightly day before. No diarrhoea.

He was an elderly male, evidently acutely ill. Markedly emaciated. Cheeks sunken—typical hippocratic facies. His abdomen was distended and board-like with no localized tenderness or rigidity. Temperature: 97.3 rectally. Pulse: 100—good quality. Respiration: 20.

Laboratory findings: White blood-cells, 6000 September 15; 7300 September 16;

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10,400 September 19. Polymorphonuclears 75 per cent, each time. *Urinalysis*: negative, except for alkaline reaction and 1+ albumen. *Wassermann*: negative to both antigens.

The abdomen was opened by Dr. E. W. Phillips. Right rectus incision. Free fluid in abdomen. Peritoneum injected. Some hemorrhagic areas along gut. No evident perforation. Pancreas felt normal. Wall of appendix injected. Appendectomy. No drainage.

Culture from peritoneum (time of operation): Pneumococcus.

Progress notes: September 14—comfortable. Abdomen less rigid, especially on left side.

September 17—wound clean. Condition good. Somewhat disturbed by frequent hiccoughing.

September 19.—Abdominal condition not good. Moderate distention. Nauseated. Vomited last night and again this morning.

September 20—A.M.—Condition poor. Coughing. Bloody sputum. Loud râles in right chest. To be X-rayed and sputum typed.

September 20—P.M.—Stomach washed out. Some mucus, very little blood, no greenish material. Later, stomach washed again—fluid returned clear. To go to operating room for drainage of thoracic duct.

September 20—P.M.—Three-inch incision parallel with lower posterior border of left sternomastoid muscle. Thoracic duct exposed, ligated and incised below the ligature. Yellow serous fluid escaped. Wound partially packed. No sutures. Orders: continue as before.

September 21—A.M.—Condition not improved. Labored respirations. Given 1300 c.c. normal salt solution intravenously.

September 21—P.M.—Condition worse. Definite pneumonia of right middle lobe. Temperature vacillated between 99 and 101. Terminal rise to 104. Pulse 100 to 120. Respirations 20 to 28. Died.

The pathological report on the appendix showed:

Mucosa.—Œdema and glandular catarrh. Round cell and eosinophile infiltration. Little lymphoid tissue.

Sub-mucosa.—Thickened. Infiltration with many round cells, eosinophiles, and polymorphonuclear leucocytes.

Muscularis.—Polymorphonuclear infiltration.

Serosa.—Covered with organizing exudate. Polymorphonuclear infiltration and hemorrhages.

CASE II.—Mr. C. L. Age fifty-seven. Admitted May 8, 1925, at 9.40 P.M., complaining of severe generalized abdominal pain. He had always enjoyed fairly good health. No serious infectious diseases nor major accidents. His present attack began at 4 P.M., May 7, 1925. While helping to carry a large heavy box of merchandise, his companion suddenly let go, so that the other end of the box struck the patient's abdomen, crushing it severely. Patient complained at once of abdominal pain and later vomited. Seen at 9 P.M. (next day) in consultation and sent to hospital. He was a well-nourished adult apparently in acute pain, with anxious facial expression. His abdomen was very tender throughout; generalized "protective spasm"; no marked distention. Temperature, 98.6. Pulse, 140. Respiration, 36.

The abdomen was opened by Dr. O. E. Jones. Several loops of small intestine pre-

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sented, inflamed and agglutinated with plastic lymph. No evidence of obstruction. The primary cause of the peritonitis was not found. Culture of peritoneal fluid taken. Two rubber drainage tubes inserted and wound closed.

The culture from the peritoneum gave pneumococcus.

Post-operative course: Temperature rapidly mounted to 105°. No rally after operation, but failed rapidly. Patient died at 10.10 A.M., May 9.

At autopsy the whole peritoneal surface was found reddened, congested and covered with fibrino-purulent exudate with more liquid pus in the dependent parts of pelvis and flanks. Exudate not bloody. No odor, no admixture of faeces or gastric contents.

The intestines were gas dilated and with serosal congestion. No rupture of intestines or of other abdominal viscera. No area of contusion or hemorrhage showing through peritoneal inflammation. Section of spleen normal. Liver and kidneys show slight cloudy swelling only. Gall-bladder normal. No duodenal or gastric ulcer. Appendix involved in general peritonitis; inflammation seems limited to surface.

No excess fluid in pleural or pericardial cavities. Rather slight hypostatic congestion at lung bases. Heart essentially negative.

Bacteriological note: Smears from abdominal pus show numerous pneumococci; no other organisms. Culture from autopsy (peritoneal exudate) pneumococci.

CASE III.—Mrs. R. Age forty-six. Admitted October 3, 1925, on account of nausea; vomiting; pain and tenderness in lower abdomen, particularly on the right.

Always healthy as a girl. Neisser infection at twenty-six, from which she says she did not recover until operated upon five years later—supra-vaginal hysterectomy and appendectomy. No gastro-intestinal, genito-urinary, or cardio-respiratory disturbances. Her present illness began September 27 (one week before admission), when she had a sudden, rather severe pain in whole upper abdomen of a dull throbbing character, accompanied by nausea and vomiting. Abdomen at this time was not tender. She was quite ill that day, but the next day seemed somewhat better. Pain remained as a dull ache, but seemed to settle slowly to the lower abdomen. She could keep nothing on her stomach, however, and had vomiting spells two or three times a day. She said she felt fairly well and had no vomiting spells the day before admission, but at night the pain became rather severe again in the lower abdomen. Next morning pain was worse and she began vomiting. She continued to get worse and entered the hospital that night.

She was a well-developed, well-nourished adult female of forty-six, acutely ill and in rather marked pain. Some dyspnoea but no cyanosis. Her abdomen was rigid and board-like below umbilicus; tenderness marked over both right and left lower quadrants; no masses. Vaginal examination, tenderness elicited in both fornices; cervix stump present; uterus missing. Temperature, 103. Pulse, 88. Respiration, 28.

Laboratory findings: White blood-cells, 7500. Polymorphonuclears, 76 per cent. Lymphocytes, 24 per cent. Urine negative, except for a few white blood-cells in sediment.

At operation, about one hour after admission, free fluid was found in the peritoneal cavity, of sero-purulent type. Intestines were congested and coated with fibrinous exudate. Appendix not present. Gall-bladder normal. Enterostomy done on left.

Smear showed pneumococci; culture showed pneumococci.

Post-operative course: Temperature remained around 102; blood culture on three different occasions showed no growth. Patient looked surprisingly well and said she felt quite well. Abdomen changed to a doughy hardness; no distention. Taking large quan-

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tities of fluid—as much as 80 ounces in a day. White blood-cells which at time of operation was 7500, three days post-operative rose to 35,000 with about 90 per cent. polymorphonuclears. Has remained at this level. Four days after operation right side of the abdomen and the right flank around to back was seen to be red. Hot magnesium sulphate packs applied for five days, when process seemed localized and there was fluctuation in the right side. Incised under local and a large amount of foul pus expressed—culture showed pneumococci. Patient at this time looked rather poorly. Temperature, 103. Patient somewhat irrational at times.

Progress notes, October 13: Back and side much better. Temperature dropped from 103 to 99.4. Patient looking and acting better. White blood-cells, 23,500.

October 14: Patient complains of diplopia. Back still somewhat red. Induration and redness almost completely gone from abdomen and side. Definite general improvement. Incision in right side, and abdomen draining pus profusely. Bowels moving without enemata. Though patient is still very sick, she has shown some improvement in last few days. Urine: 2+ albumen; rare white blood-cells; on culture and direct smear, Gram-positive bacilli. Wassermann, negative.

October 16: Condition unimproved. Temperature septic in type. Less induration in back. Suggestion of fluctuation on both sides of spine.

October 17: Definite abscess formation, especially on right side of back. Incised under local anaesthesia. About six ounces of pus exuded.

October 19: Pulse poor. Patient very toxic. All incisions are necrotic-looking. Profuse drainage. Sutures removed from abdominal incision which is widely gaping. Large mass of necrotic fascia removed and then wound was strapped with adhesive. Coil of small intestine forms floor of the abdominal incision.

October 20: General condition continues poor. Patient not taking food. Appears and acts as though overwhelmed by toxæmia. Temperature about 102. Fæcal fistula developing. White blood-cells, 11,300.

October 22: Grew progressively worse and died. Autopsy refused.

Discussion.—From a study of the above cases, it is obvious that primary pneumococcus peritonitis is *not* solely limited to young girls nor even to the female sex. We are supported in this contention not only by the case reported by Montgomery (*vide supra*) but by at least five additional authentic cases in the literature:

1. Two cases of primary pneumococcus peritonitis in male nurslings, ages six months and ten weeks, respectively, reported by Ribadeau-Dumas et Meyer.⁴
2. One case of primary pneumococcus peritonitis in a male infant, age five weeks, reported by G. L. Hallez.⁵ (This infant was partially bottle-fed because the mother developed an abscess of the breast—hence, infection *via* the intestinal tract cannot be ruled out.)
3. One case of primary pneumococcus peritonitis in a boy, age sixteen, reported by Paisseau et Duchon.⁶
4. A case of primary pneumococcus peritonitis occurring in a woman at

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the eighth month of gestation.⁷ (In the words of Bruce M. Dick, the author, ". . . it is difficult in such a case with a pregnant state of the uterus to conceive of a spread of infection from the lower genital tract taking place.")

The rôle of trauma in the causation of pneumococcus peritonitis, as exemplified by Case II of our series, has seldom been considered. Hence we call attention to the interesting experiments by Peiser,⁸ in which he demonstrates that the serous membranes, particularly the peritoneum, so long as they are uninjured, are impermeable to bacteria circulating in the blood stream. Invasion through *intact* peritoneum takes place only in the moribund stage of a severe septic process. Peiser found, however, that in cases where the peritoneum had been subjected to even the slightest degree of trauma (intraperitoneal saline solution suffices), bacteria will enter the peritoneum from the blood stream very quickly. Depending on the virulence of the bacteria and the resistance of the individual, peritonitis may or may not result.

No specific serum therapy was attempted in our cases. The literature reveals (1-9) that of a total number of 22 cases that were typed, 16 were Type I, 3 Type II and 3 Type IV. Of 6 Type I cases treated by specific serum therapy, only 2 are reported to have been benefited.

CONCLUSIONS

1. The source and mode of infection of pneumococcus peritonitis in the so-called primary or idiopathic cases is not solely *via* the genital organs in young girls nor is this disease limited to the female sex.

2. Trauma is an occasional etiological factor.

I wish to thank the members of the surgical staff for their kindness in permitting me to report these cases.

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TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY

Stated Meeting Held November 11, 1925

The Vice-President, DR. FRANK S. MATHEWS, in the Chair

CARCINOMA OF TONGUE

DR. GEORGE H. SEMKEN presented a man, aged forty-seven years, who first came under observation, May 22, 1918. Six or eight years previously a pin-head sized, white spot had appeared on the left side of the tongue; and this had grown slowly but progressively. There had been no treatment of the growth prior to two months previously, when radium treatment (by surface application) had been begun. No benefit resulted from the use of radium, but instead, a moderate degree of leukokeratosis had been added. There was no history of a known antecedent case of cancer; the previous history was negative. There was no demonstrable syphilis. The Wassermann test was negative; and the only discoverable etiologic factor was the excessive smoking of strong cigars, which were usually held in the same position (one place). Examination showed a pearly-white, mushroom-shaped papilloma on the left border and dorsum of the tongue. The lesion was excised under local anaesthesia, June 17, 1918. Histologic examination (by Dr. Francis C. Wood) showed it to be a papilloma, with one small area of "breaking through,"—an early epithelioma.

Although the incision had been wide and relatively deep, early in October, 1919, a new lesion appeared on the under surface of the left half of the tip of the tongue—an elevated ulcer 0.4 cm. in diameter, with indurated edges, which proved to be a frank squamous-celled epithelioma.

In cases of cancer of the tongue, the cancer field consists of the lesion and the related lymphatics. It has been shown by Küttner (*Beitr. z. klin. chir.*, 1898, vol. xxi) that the lymphatic apparatus of the tongue is very rich in anastomoses, and that it is possible to inject the lymphatics of both sides of the neck from a single puncture in any part of the tongue. The chief nodes related to the tongue lie in the carotid packet of the deep chain, in the region of junction of the lingual and common facial veins (or their combined trunk) with the internal jugular vein. Other lymphatic vessels lead to the submaxillary group of lymph-nodes; and still others lead directly to a lower group of the deep chain, at the crossing of the omohyoid muscle over the internal jugular vein, without passing through the upper groups of this chain—notably, two lymphatic vessels from the region of the tip. Küttner did not find any lymphatic vessels leading from the tongue to the submental packet of lymph-nodes, but such vessels were later demonstrated by Jamieson and Dobson (*British Journal of Surgery*, 1922, vol. viii), who verified the other findings of Küttner. These observations have been borne out also, by clinical experience with cases of cancer of the tongue, the cancer metastases following the same channels as the injected dye solution (suspension). It has been accepted, therefore, that the lymphatic removal in cases of unilateral cancer of the tongue, if completely done, must include the complete lymphatic dissection of the side of the neck corresponding to the side

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of the lesion, together with the submental lymphatics, and the submaxillary and deep chain of the opposite side of the neck, down to the omohyoid crossing.

The extent of excision of the tongue, in unilateral cases anterior to the vallate papillæ, is a little more than one-half. In order to avoid a sharp tongue tip, the tip of the healthy side is removed. In order to include the small lymph-nodes in the middle line of the tongue, the longitudinal line of incision is carried along the uninvaded half of the tongue, adjacent to the midline; and in order to include as many lymphatic trunk vessels as possible, the incision is made to curve further on the healthy side, posteriorly, to sweep around the freely decussating vessels at the apex of the vallate papillæ; and it is carried about the lower pole of the adjacent tonsil, where the main dorsal lymphatic vessels dip down into the neck. The tonsil is sometimes included in the removed tissue mass. In order to insure a complete excision without crossing the cancer field, it has been found desirable to place a series of black silk suture guides, with ends left long, at landmark points on the tongue. It is difficult to recognize anatomical landmarks in the mouth if there is any bleeding; but this difficulty is overcome when the suture guides are used, and the incision is kept outside of these, always in the healthy tissue. As a precaution against implanting cancer cells upon fresh wound surfaces, the surface of the lesion is well cauterized with the actual cautery before the excision of the tongue segment is begun. The intra-oral operation, without jaw splitting, is done in all cases in which there is no involvement of the floor of the mouth or of the posterior region of the tongue.

An operation of this extent requires its division into two stages, and it is the present practice, following the suggestion of Butlin and others, to include the tongue operation in the first stage, to prevent any further dissemination of cancer from the primary focus during the interval. Technically, this is a disadvantage because a preliminary ligation of the lingual artery of the affected side together with the division of the hypoglossal nerve and the lingual branch of the fifth nerve, is followed by a very considerable retrogression in the lingual tumor, and makes the tongue operation less difficult. Also, it has been found undesirable to dissect the side of the neck corresponding to that of the lesion at the same operation as that upon the tongue, because of the likelihood of infection of the neck wound *via* the cut lymphatic vessels from the mouth. The plan adopted, therefore, has been the dissection of the opposite side of the neck and the removal of the tongue segment at the first operation, and the block dissection of the related side of the neck after a suitable interval, not less than ten days, preferably two or three weeks. A temporary control of the external carotid by untied ligature angulation is helpful in controlling the bleeding during the first part of the intra-oral operation. In the case under consideration, however, the order of these stages was reversed. November 15, 1919, at the Skin and Cancer Hospital, under colonic ether anaesthesia, a complete block dissection of the lymphatic of the left side of the neck was done. The removed tissue included the submental and submaxillary groups, the superficial chain, the deep chain from the jugular fossa to the clavicle, and the supraclavicular node group. The lingual artery was tied, and the hypoglossal and lingual nerves were divided. November 25, 1919, the operation on the lymphatics of the right side was done, the submaxillary group, the superficial chain, and the deep chain from the jugular fossa to the omohyoid cross being included in the excision; and the left half of the tongue together with part of the right half of the tip and the tissue at the lower pole of the left tonsil, was removed. Recovery was uneventful, the patient left the hospital December 10, 1919, and has had

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no subsequent difficulty. His speech is good, and he has been able to continue his work with the New York Fire Department. The histological examination of the removed lymphatic tissue showed no metastases in the sections examined.

CARCINOMA OF ANTERIOR FLOOR OF MOUTH—SEDILOT OPERATION

DR. GEORGE H. SEMKEN presented a man, aged forty-six years, who came under observation, November 22, 1920. Six months previously, he had noticed a lesion in the anterior part of the floor of the mouth, but sought no advice until a few days before his admission to the New York Skin and Cancer Hospital. There were no known antecedent cases of cancer in the family and the only discoverable possible etiologic factor was the free smoking of a corn cob pipe, which, however, had been discontinued about two years previously. Examination showed a slightly elevated lesion of the low papillary type, in the anterior part of the floor of the mouth, about the orifices of the submaxillary salivary ducts, approximately 2.0 cm. in diameter, but irregular in extent, deep red in color, and slightly indurated. There were no palpable lymph-nodes in the neck. The Wassermann examination was negative.

The operation was done in two stages, with an interval of ten days, and in reverse order to the present practice in cancer cases—namely, the removal of the lymphatics was done at the first stage, and the lesion was removed in the second. November 30, 1920, a bilateral dissection of the upper cervical lymphatics was done, in one block. The submental group, both submaxillary groups, the superficial chains and each of the deep chains of nodes from the jugular fossa to the level of the omohyoid crossing, were removed. The dissection included the outer segment of the sheath of the internal jugular vein; and in the deep chain groups were included the nodes posterior to the internal jugular vein, over the scaleni and levator anguli scapulae muscles. An uneventful healing followed. December 10, 1920, the Sedillot operation (later elaborated by Kocher) was carried out. The lower lip was divided in the midline, and this incision was continued in the midline of the neck, to the level of the hyoid bone. The anterior surface of the symphysis of the mandible was exposed with the rasperatory and four small drill holes were made in a straight line along the long axis of the bone, two on each side of the midline of the jaw. The bone division was made from the drill holes in the middle, leading upward from one and downward from the other, and they were joined by a small transverse chisel cut at right angle to the line of bone section, thus making the bone cut slightly terraced in shape. The muscle attachments (anterior belly of digastric, mylohyoid, and geniohyoid), were divided for a short distance, the cut bone ends were strongly retracted, and the lesion in the floor of the mouth was excised. The excised tissue included a wide margin of healthy mucous membrane, the submaxillary salivary ducts, the remnants of the submaxillary salivary glands, the sublingual salivary glands, and part of the anterior muscular floor of the mouth. The raw surface was lightly cauterized to destroy possible cancer implants and to form a temporary barrier against infection. The bone was united with a chromic catgut suture passed through the outer drill hole of each side; and the divided lip and neck regions were carefully sutured. At the conclusion of the operation, a dental fixation splint was placed over the lower teeth to insure proper alignment in the jaw. The soft tissues healed at once, but sequestra separated from the mandible until about three months later. There has been no return of the growth, the present appearance is good, and there is no disturbance of function in the mouth or the jaw. The report of the histological

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examination of the tissue removed showed squamous-celled carcinoma in the lesion and no metastases in the node sections examined.

DOCTOR SEMKEN added that every case of cancer in the mouth and tongue, except some of those of the upper jaw, is squamous-celled in type, and is a potential metastasizing tumor. The report of negative findings in the histologic examination of the regional lymph-nodes may be misleading, for it can apply only to the few sections examined, and other fields containing cancer may be overlooked. This was clearly shown by Gussenbauer many years ago (*Monatschr. für Heilkunde*, vol. ii, 1881), and it has been substantiated by the experience of recurrences in lymphatic areas beyond the limits of excision in cases where the excised nodes showed no cancer in the sections examined. If surgical operations for cancer are to save life, the procedures must be extensive and complete, irrespective of the small size and brief duration of the lesion, and the absence of palpable regional lymph-nodes.

HEMIGLOSSECTOMY FOR TONGUE CANCER

DR. WINFIELD SCOTT SCHLEY presented a man on whom he had performed this operation six years ago, for extensive carcinoma of the whole right anterior two-thirds of the tongue and dorsum to the midline and with glands in the neck. Two other similar cases, alive and well after four years and twelve years respectively, he had expected to present as well, but they were prevented from appearing by temporary illness.

When first seen, the patient presented seemed in such bad condition that operation hardly appeared feasible; but after oral antiseptics there was sufficient improvement to appear to warrant operation. Extensive block dissection of the neck, upon the side involved only, followed by hemiglossectomy was done.

As Doctor Schley has stated and written before, the results in such cases, as in all cases of cancer, were directly proportionate to the care exercised and upon the extent of the first operation, as one might not have a second opportunity, and recurrences were usually much more difficult to deal with. These cases, as in others he had reported, showed what could often be done with apparently hopeless conditions if they were prepared properly and operated on carefully and extensively.

PLASTIC SURGERY IN CHILDREN COMPRISING BRIDGE FLAPS, PEDICLE FLAPS, TUBED FLAPS, AND EPITHELIAL INLAYS

DRS. CARL G. BURDICK and FENWICK BEEKMAN presented a series of nine children to illustrate this theme. The first case demonstrated the use of the Esser Epithelium Inlay as used by Gillies. The child, when sixteen months of age, was burned on the chin and neck. He was seen first in September, 1923, when eight years of age. At that time his chin was drawn down, partly upon his chest, and there was a marked ectropion of the lower lip.

On operating, an incision was made along the entire length of the lower lip just below its vermillion border. The lower flap was well undermined. It was found that the entire thickness of the lip was composed of scar tissue, the muscles having been entirely destroyed. A mould or stent was made of the cavity formed by the undermining, from dental moulding compound. This mould was covered with a large Thiersch graft with its raw surface outward, and the stent, with the overlying graft, was buried in the wound,

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the original edges of the incision being again sutured together. Of course, this accentuated the deformity. In five days it was found that the stitches had sloughed and the cavity had opened; the stent was removed; the graft, however, had taken and the wound was represented by a cavity lined with skin, which later flattened out.

Because of lack of musculature in the lip, there was still a tendency for it to sag, so a year later a V-shaped section of the full thickness of the lip was removed just mesial to the right angle of the mouth, thus taking a tuck in the lip.

There is still some tendency for the boy to let his lip sag, but this has been helped by educating him to draw up the corners of his mouth.

The advantage of the "inlay" in this case was an improvement of his deformity by a comparatively simple operation, which if it had failed, would not have interfered with a further plastic operation by means of flaps. "The Esser Inlay" is often useful in contractions of the face in combination with other operations.

The second case demonstrated the use of a tube flap, with epithelium on the inside, in forming a new axilla in a contracture at the shoulder. It is not a new method, but they had found it far superior to sliding flaps, as it makes an excellent apex without any suture line. In the sliding flaps the suture line usually is at the apex and often sloughs.

The child had an old burn about the axilla. When he was admitted to Bellevue Hospital there was a fold of scar tissue measuring about three centimeters thick from the chest at the mid-axillary line to the arm, which limited abduction to about 120 degrees. The first operation consisted of raising a flap two inches wide and four inches long with its base just below the right clavicle and tubing it with the epithelium on the inside. A small incision was made in the skin at the lower edge of the latissimus dorsi muscle and a clamp was passed through the axillary scar coming out at the lower edge of the pectoralis major muscle, anteriorly. The tube flap was then drawn through this tunnel and its skin edges were sutured to those of the skin posteriorly. In time the pedicle of the flap was divided.

At the second operation, a curved incision with its concavity downwards was made between the anterior and posterior openings of the tubed flap and carried on into the tube, dividing it longitudinally. In cutting into the tube, care must be taken that none of the structures of the arm are injured as the anatomy of the part may have been distorted by the contraction of the scar tissue. The upper flap, formed by this incision, was then sutured to the proximal edge of the divided tube and a full thickness graft from the abdomen was sutured in the place between the distal edge of the tubed flap and the skin of the arm. This operation has given this boy a very useful shoulder-joint and well formed axilla.

The third case was one of plastic operation for contraction of the hand following a severe burn in infancy. It illustrates the advantage of a tubed flap over the ordinary bridge flap.

The patient, a girl aged thirteen years, had her right hand severely burned when an infant. On admission to the hospital, the wrist was held flexed at a position of 90 degrees to the forearm and there was a web between the forearm and arm. The little finger was entirely absent, the ring and middle fingers had been removed at the proximal phalangeal joints, the index finger was perfectly normal. The joints of the thumb were entirely ankylosed excepting its carpal-metacarpal joint. It was held bound vertically to the wrist joint by scar tissue, and what represented its distal phalanx was bent

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almost at a right angle to its proximal portion. Apparently only the adductor and opponens muscles were present. The patient was unable to approximate the tip of the index finger to the thumb, the hand being practically useless.

The first operation attempted consisted of dividing the scar tissue at the wrist, which was found to extend down to the tendons. When it was divided, the hand could be extended to within 20 degrees of the normal position. The hand was then thrust through a bridge flap on the right thigh and the edges of the flap sutured to the edge of the incision. Following operation, the raw surface of the flap became infected, which caused a good deal of trouble. Finally the pedicles were divided and when the wounds had healed, it was found that the patient was able to approximate her index finger and thumb. However, the wrist was still held in a position of slight flexion, and the transverse carpal arch was very much contracted, the palm having a deep cavity. Soon after a double tube pedicle flap was raised on the left side of the abdomen. When this was healed the lower pedicle was divided and the end closed. Later the scar tissue was dissected from the palm of the hand and the deep cicatricial tissue about the wrist divided, allowing the flattening of the transverse carpal arch and the extension of the hand at the wrist to about ten degrees beyond normal position. The tube flap was then split and sutured into the defect, in due time the remaining pedicle being divided.

The last operation upon this patient was an osteotomy on the bone of the thumb to straighten the deformity at its distal phalanx.

The advantage of a delayed tube flap over a bridge flap when taken from one part of the body to be used on another is that there is so much less danger of infection and the added advantage that the blood supply is so much better established in the former, as the flap has been raised some period of time before attaching it to its new position, while in the latter, the flap has to be sutured in place immediately to prevent infection. Besides this, the resulting scar from where the flap has been removed is apt to be less disfiguring in the case of the tube flap because of lessened chance of infection.

The fourth case was a child who, in 1919 at the age of two years, was struck by a trolley car, resulting in a traumatic amputation through the heads of the metatarsal bones of the left foot. After the wound became covered with healthy granulations, several attempts were made to skin graft the stump, but as soon as the patient attempted to wear a shoe or bear any weight on the foot ulcerations would develop. In January, 1923, a flap was taken from the right thigh. This covered the stump fairly well, but inasmuch as there was some scar tissue remaining on the sole of the foot, the tendency to ulcerate at this site persisted. Later an attempt was made to excise this and bring normal skin edges together, but this was unsuccessful. In September, 1924, Doctor Beekman took a second flap from the calf of the right leg after excising the scar tissue. This healed very nicely, but as soon as the child began to bear any weight on the extremity ulcerations again appeared. She was kept in bed several months until the ulcerations finally healed. Now, with care in wearing a white cotton stocking instead of a black one, she is able to get about, and there is reason to hope that all tendency for the stump to break down has permanently disappeared.

The fifth case, in December, 1920, at the age of eight years, suffered a traumatic amputation involving all the metatarsal bones of the left foot except the first, which was disarticulated at the metatarso-phalangeal joint. After healing, the scar on the dorsum of the first metatarsal would ulcerate whenever any kind of a shoe was worn. One year after

PLASTIC SURGERY IN CHILDREN

the initial injury an attempt was made to tube a flap from the same leg. Due to the incisions in the leg from the original injury, it was impossible to make the flap more than 4 cm. in width, and when the attempt to tube it was made, it was found that in order to suture the tube so much of the subcutaneous tissue would have to be sacrificed that the viability of the flap would be jeopardized; consequently the skin was simply closed beneath the flap and the under surface of the latter was allowed to epithelize. At the end of six months the epithelium had entirely covered the posterior surface of the flap and in several stages at intervals of a few days the upper end of the flap was cut across and swung down and sutured to the normal skin of the stump after excising adjacent scar tissue equal to the end of the flap, the blood supply being derived from the proximal end which was not disturbed. About 2 cm. of the distal end sloughed and they had to wait five months before they excised the remainder of the scar tissue on the dorsum of the foot, splitting the flap longitudinally and spreading it out over the denuded area and suturing it in place. One month later the base of the pedicle was cut across. These various operative procedures were spread over a period of one year. He now has a serviceable foot and with the aid of a properly padded shoe walks very well. A white cotton stocking is worn to prevent subsequent irritation.

This case illustrates the importance of making the flap of sufficient width to tube without tension, but failing in this the possibility of ultimate success by dividing the flap in repeated stages so as not to interfere with the blood supply too much at one sitting. Probably an immediate skin graft of the posterior surface of the foot would have saved this patient considerable time.

The sixth case was a girl who, in April, 1922, at the age of nine, received a third-degree burn resulting in a cicatrical contraction of the neck. This contraction is limited chiefly to a single band about 1 cm. in width extending from the chin to the sternal notch. A plastic operation was performed in February, 1924, the technic being as follows: quadrilateral areas were made on either side of the cicatrix 7 cm. long and 5 cm. wide. The cicatrix was dissected from above downward and left attached at its base. A transverse incision was made in the skin of the chest about 12 cm. long and the skin between the latter and lower end of the neck incision was undermined, this procedure allowing the skin at the base of the neck to be elevated. The flaps in the neck were approximated with horse hair, a portion of the cicatrix being excised, the remainder being used to fill in part of the open area. The wound on the chest was covered with Thiersch grafts.

This case illustrates one of the simple methods of plastic surgery of the neck. Its application seems to be limited to the group of cases where the contracting band is narrow and the amount of scar tissue limited. The fact that a vertical incision remains at the end of the operation is one of its greatest drawbacks.

The seventh case was a girl who at the age of twelve years received a third-degree burn of the neck and chest. There was contraction of the neck with extreme eversion of the lower lip.

In April, 1920, a transverse incision was made through the cicatrix of the right side of the neck and all scar tissue excised down to the fascia, a flap was swung around from the right scapular region which healed per primam. The area from which the flap was taken was later Thiersch grafted. This overcame the deformity of the right side of the neck and lip and our next problem was to get a flap to correct the deformity on the opposite side. The only normal skin in the vicinity lay over the left scapular region, and in

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July, 1920, a tubed flap six inches long was made in this region; six weeks later the outer end of the tube was cut across and swung forward to the sterno-clavicle region after excising sufficient tissue to imbed the flap. In November, 1920, the proximal end of the flap was cut and attached to the muco-cutaneous junction of the left lower lip. They now had a tubed flap removed in two stages and attached below in the left sterno-clavicular region and above to the left muco-cutaneous junction of the lip. In December, 1920, the scar tissue beneath the flap was excised, the flap unfolded and sutured into the denuded area. A moderate retraction of the left angle of the mouth persisted, and in November, 1921, a V-shaped incision was made at the base of the transplanted flap and it was slipped upward about 3 cm. This relieved most of the retraction, but the normal crease beneath the lip was missing due to the attachment of the flap directly to the muco-cutaneous junction. To correct this, in November, 1922, an epithelial inlay was inserted which has greatly improved the deformity. This patient represents a sliding flap, tubed flap and epithelial inlay. Of necessity the scars were vertical which, of course, was a handicap. The subcutaneous tissue of the tubed flap remains and is in itself a deformity, for this reason, a full thickness graft might have been a better procedure.

The eighth case was a female child who, in January, 1923, at the age of three years, received second- and third-degree burns of the neck, chest and both arms resulting in cicatrical contractures of the anterior surface of the neck. She was discharged in two months and continued to return to the follow-up clinic at regular intervals, but inasmuch as no operation was advised for some time her parents became restless and took her to another hospital, where she was operated three times in the latter part of 1923.

She was readmitted to Bellevue Hospital in October, 1924. Her previous operations had improved her considerably, but she still had a well marked contracture extending downward from the chin to the chest, limiting extension of the chin and definitely depressing the lower lip. A flap was raised from the right scapular region and then sutured back in place. The distal end sloughed slightly, entailing a wait of several weeks for this to heal before proceeding further. Later transverse incisions were made on either side of the cicatrical band to prevent subsequent vertical contractions and connected by a tunnel, care being taken to have the tunnel posterior to all scar tissue. The flap was now raised again, tubed with the skin surfaces on the inside and passed through the tunnel and sutured. Three weeks later the base of the tube was divided and all raw surfaces sutured. The final stage of the operation was completed by opening the tube, excising the scar tissue and suturing the edges of the tube to the skin of the neck.

This case represents a delayed tubed pedicle flap. The fact that part of the flap sloughed justified the employment of the delayed flap method. The flap was tubed instead of the scar tissue being excised immediately because by tunnelling the cicatrical band well behind the scar tissue and by firmly imbedding the flap they were in a position later to excise more thoroughly all scar tissue and probably preserve more skin than if they had completed the operation in one stage.

An additional factor of safety is that by the time the tube is opened all denuded areas are healed and primary union of all skin edges is practically certain.

The last case was a boy who in 1919, at the age of seven years, was burned by an explosion of gasoline. He had a winter cap and muffler on

FRACTURE OF NECK OF FEMUR

at the time which caused an injury similar to the burns aviators received during the war. When admitted to the Childrens' Surgical Service at Bellevue several months later there were the scars of a third-degree burn of the entire face causing contracture of the mouth to about one-quarter its normal size, ectropion of both lower lids, marked flattening of the nose with contraction of the nostrils and dense scar tissue about each cheek. Attention was first directed to the mouth; lateral incisions were made on either side through the scar tissue, skin and mucous membrane, an attempt being made to identify the muscle at either angle. The skin and mucous membrane were sutured with a fairly satisfactory result. A few months later he was readmitted and Doctor Gillies saw him at this time and suggested radium to soften the scar tissue. This was continued at intervals over a period of two years with considerable softening of all scar tissue. In the fall of 1922, a double epithelial inlay was performed for the ectropion with a fairly satisfactory result.

Radium treatment was continued for several months until the patient left town. In April, 1925, he was readmitted and an effort was made to correct the contour of the nose and upper lip by inserting an inlay at the junction of the nose and lip. Some improvement followed, but as they did not get a hundred per cent. take it was not as satisfactory as had been anticipated. An attempt next to correct the eversion of the lower lip by a similar inlay will be made.

Whether a new nose should be attempted by swinging down a flap from the forehead or not is difficult to decide.

FRACTURE OF NECK OF FEMUR—MALUNION OPERATION

DR. WILLIAM BARCLAY PARSONS presented a woman, aged forty-eight, who was admitted to the Presbyterian Hospital in October, 1922. She had slipped after alighting from a bus and sustained a Colles fracture of the left wrist and a fracture of the neck of the left femur. It was put up in plaster and abduction, but she proceeded to absorb the neck. The case was left on for three months. She then received massage and was given a walking Thomas brace. She did not begin to walk until six months following the injury, but at the time the X-ray showed fairly complete absorption of the neck of the femur with the greater trochanter almost in contact with the acetabular rim. The head, however, exhibited surprisingly good nutrition and a little fibrous union had occurred as the head would rotate with the shaft.

After six months of activity with the brace no evidence of further repair had occurred, so she was admitted and was operated upon through the Smith Peterson incision. A common wire nail was inserted through the greater trochanter into the head and with a drill several holes were bored through the trochanter into the head. Following this she was kept in a plaster spica for thirty-nine days, after which she received massage and exercise and was allowed to walk in her brace.

The facts of most importance were the fibrous union, the loss of distance between the head and shaft, consequent limitation of abduction and her skill in the use of her brace. Inasmuch as the head was in good condition, it was considered wise to attempt to use it rather than to implant the trochanter into the acetabulum.

At the present time, two years after the second operation, there is apparently firm union. She discarded the brace after one year. Measurement shows about $1\frac{1}{2}$ cm. of shortening. Flexion and extension are complete at the hip, but there is limitation of flexion at the knee. The recent X-rays show the amount of adduction and abduction possible.

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She is shown as an example of a good functional result, following a conservative operation where there had been absence of repair with absorption of the neck in a case of fracture of the neck of the femur.

Doctor Parsons then presented a man of forty, who was admitted to the Presbyterian Hospital in April, 1922, complaining of pain in the region of the left hip and marked interference of function. Slightly over a year before in another city he had received a fracture of the hip, presumably an intertrochanteric one, and was at first treated with traction for eleven weeks. No union was obtained, so he was operated on and two nails were inserted. He was then in a case for thirteen weeks, in bed for six months more and in a chair for three weeks, making a total of nearly one year of incapacity.

When he presented himself at the hospital he had a shortening of $2\frac{1}{2}$ cm. with marked inward rotation and adduction. The muscles of the thigh and calf showed extensive atrophy, and there was considerable limitation of motion at the knee. X-ray at that time showed the two nails driven through the shaft and neck, an angle of about 90° between neck and shaft and an unusual prominence of the greater trochanter. The outlook for a good result from an osteotomy was decidedly compromised by the degree of atrophy and myositis. During this long period of treatment he had received no massage nor graded exercises at any time.

At operation the nails were removed and a wedge-shaped osteotomy done to correct the marked coxa vara. The osteotomy was rather easy on account of distinct atrophy of the bone. An attempt was made to save the hinge on the inner side, but this broke. The leg was put in abduction and external rotation. He was kept in bed in a case for $3\frac{1}{2}$ months and this was then removed and massage and baking instituted. After five months of bed and chair treatment he was allowed to walk on crutches. The X-ray at that time showed moderate callus formation but apparently union. He was given a walking Thomas brace and continued massage and baking. He used the brace for nearly two years whenever he went out of the house. The X-rays from time to time showed gradual increased density of the bone, but in spite of considerable coöperation on his part there has been comparatively little increase in the size of his left leg.

At the present time, thirty-six months since operation, he has no external rotation of the foot, has complete extension and flexion of the hip and still has some limitation of flexion at the knee. On the other hand, there is no shortening, there is no adduction and no internal rotation. As far as his walking is concerned the interference with muscle action and knee-joint function are the two factors militating against a perfect symptomatic result. He is shown as an example of the bad results following lack of care of the limb as a whole and of the improvement that can be obtained by a comparatively slight operation correcting a not inconsiderable deformity.

EPIPHYSEAL INJURIES AT THE LOWER END OF THE HUMERUS

DR. WILLIAM DARRACH read a paper with the above title.

DR. JOHN J. MOORHEAD said with reference to the occurrence of the swelling in the bend of the elbow to which Doctor Darrach had called attention, it occurred frequently and was not always an early post-traumatic manifestation. Recently he had an opportunity of doing a biopsy in such a case on a boy who had developed a bony lump in front of the elbow which simulated a myositis ossificans. This followed an open reduction of a posterior dislocation of the elbow performed by one of his assistants through a small

TOTAL CYSTECTOMY FOR CARCINOMA OF BLADDER

posterior incision followed by smooth convalescence. There was much controversy as to what caused the pseudo-bony formations following elbow trauma and the speaker's own idea was that the late John B. Murphy has given the real explanation by showing that the elbow capsule consisted of two layers, the inner of which contained embryonal bone cells which became activated following trauma. Whatever the origin, the functional outcome is usually good, and it was unwise to interfere too early with swellings of this sort.

DOCTOR DARRACH, in closing the discussion, said that Doctor Moorhead's suggestion that the induration might be due to periosteal proliferation would only hold in the later weeks. There was X-ray evidence in a few of the cases that this had taken place, but the early deeper induration was probably due to hemorrhage between or superficial to the periosteum with subsequent organization of the clot.

The speaker wished to add that in his experience there was no limitation of pronation and supination.

In summing up the injuries to the lower epiphysis the speaker believed that in addition to the type commonly recognized with displacement of the lower fragment there was a considerable number of cases where the epiphysis was injured with resulting hemorrhage, but without displacement of the lower fragment. Such cases presented the clinical picture of a supracondylar fracture or a displacement of the lower epiphysis except that the X-rays were negative. Therefore where, following an injury, the elbow presented such a clinical picture with swelling, tenderness and limitation of motion with a negative X-ray, the case should be treated with this injury in mind. There should be sufficient protection to the bone with the early establishment of gently guided movements and massage. Of greatest importance is the prognosis and the patient or his parents should be warned that complete restoration of function might not take place for several months. The presence of a deep, firm induration in the neighborhood of the epiphyseal line persisting after the subsidence of the superficial swelling was a symptom which differentiated this group from the ordinary sprain.

The injuries to the epiphysis of the internal epicondyle fell into three groups: those with little if any displacement; those with moderate displacement (.5 to 2 cm.) and those with marked displacement and sometimes interposition of fragment between the articular surfaces. The latter group and some of the second are often associated with dislocation at the elbow. Open reduction was indicated in the last group and very occasionally in the second.

Stated Meeting Held November 25, 1925

The President, DR. WALTON MARTIN, in the Chair

TOTAL CYSTECTOMY FOR CARCINOMA OF THE BLADDER

DR. EDWIN BEER presented a man, thirty-five years of age. Fifteen months prior to admission to the hospital, March 23, 1925, haematuria and pain on urination began. This subsided rapidly but two weeks prior to admission the haematuria recurred. Haematuria was not total; was present

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at onset of micturition and at end. Physical examination showed evident loss of weight. By rectum, the prostate and bladder felt like one indurated mass which was definitely ballotable, suggesting neoplasm of both of these organs. Functional kidney test was normal and X-ray of genito-urinary tract was negative. A cystogram X-ray showed an irregular bladder with the bladder circumference raised by an enlarged prostate above the symphysis, and air injection of the bladder showed an irregularity which suggested the presence of tumors projecting into the bladder cavity. Cystoscopy showed a congested bladder holding only three and one-half ounces, full of papillary tumor, partly necrotic and partly fluffy. The left posterior wall seemed to be free from growth. Cystoscopic diagnosis was papillary carcinoma with multiple tumors.

On March 27, 1925, a total cystectomy with removal of seminal vesicles and upper part of prostate was performed. The approach was through a median suprapubic incision. The peritoneum was opened and the viscera explored for metastasis. As none were found, the peritoneum was immediately closed and the bladder mobilized as in the technic described before this Society some years ago. After the bladder was completely mobilized and drawn up over the abdominal wall, the ureters were identified and separated from the tumor mass and subsequently implanted in the iliac fossae through a gridiron incision. Here they were fixed to the skin and intubated with ureter catheters. The large bladder mass which had been mobilized, felt like a most extensive infiltrating growth suggesting that all the bladder wall was involved in a carcinoma. With the prostate well freed, transfixion stitches of heavy silk were inserted through the prostate as a pedicle and tied, whereupon the bladder (unopened), the upper half of prostate and seminal vesicles were removed in one mass. There was some shock from the operation necessitating transfusion. On opening the bladder after its removal, it was found to consist of a very thick bladder wall edematous in places, and the seat of multiple large and small papillary growths, the largest being situated near the right ureter. Microscopic examination of one of these growths near the neck of the bladder, whose base was very hard, showed papillary carcinoma. Other tumors examined showed benign papilloma. The bladder wall itself showed no extensive infiltration as had been expected from palpation of the organ when in the speaker's hands. The post-operative course was not uneventful as the patient developed chills due apparently to pyelonephritis with colon bacilli temporarily in the circulation. Both sides drained well, and after a temporary attack of pyelonephritis on each side, the urine became fairly clear and the patient was allowed to leave the hospital with his ureters intubated.

In view of the fact that the patient is fairly comfortable and gets along very well, both ureters draining in this way into a receptacle, there is no particular indication for transferring the ureter into his large bowel. If the patient could not be kept dry, as he is at present, this type of implantation might be considered, though results to date in the speaker's hands have not been as satisfactory as when the ureters are implanted into the skin.

MULTIPLE DIVERTICULA OF URINARY BLADDER, WITH STONES

DR. EDWIN BEER presented a man, twenty-four years of age, and described the case as follows: The patient had had one year's history of attacks of retention, and one attack of haematuria with pain over bladder. He had marked frequency q.2.h./3-4 with pain at end of act. The above bleeding lasted a whole week. X-rayed at this time; multiple stones were shown in

MULTIPLE DIVERTICULA OF URINARY BLADDER

the picture in the position of the bladder. He was not cystoscoped, and had no kidney pain. After the skiagraph was taken, he had occasional bleeding, and about eight weeks before he was seen by the reporter, he had a severe attack of pain with terminal bleeding and retention. Control X-ray taken eight weeks ago showed the same shadow, the size of a silver half-dollar. Seven weeks before he was seen by Doctor Beer, a suprapubic cystotomy had been done and no stone was discovered and the necks of several diverticula were felt. Suprapubic drainage was instituted and subsequently an

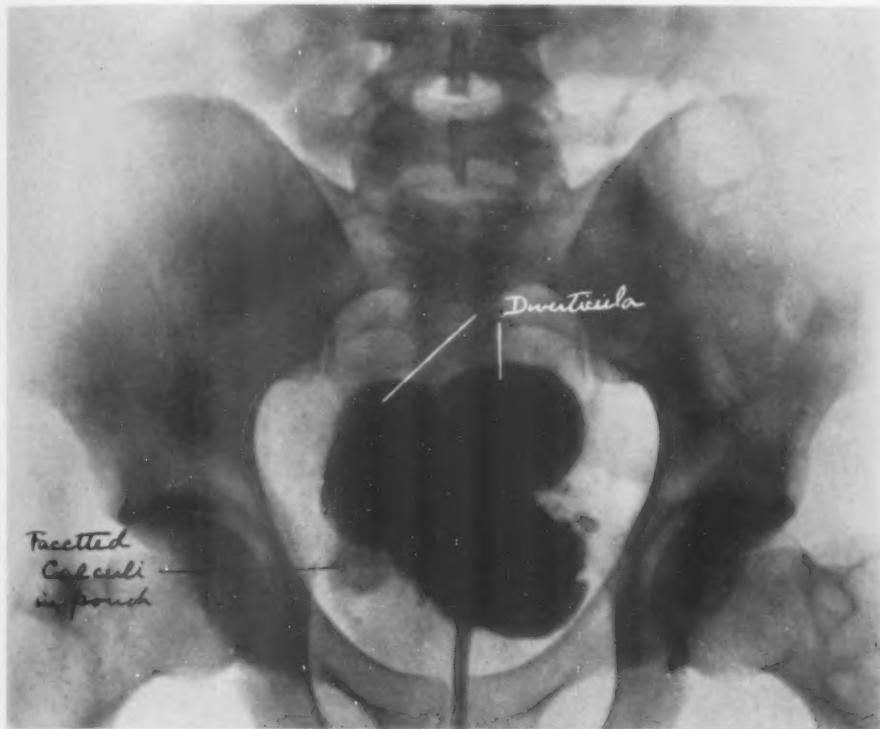


FIG. 1.—Multiple diverticula, one packed with stones. Contracture of neck of bladder.

indwelling catheter was used, but the bladder wound refused to heal, so that when first seen June 8, 1925, he was passing all his urine through the suprapubic sinus and had ten ounces residual, purulent, turbid, foul urine. The sinus was in the centre of the suprapubic scar and when the patient voided ammoniacal urine, it squirted out through this tract. By rectum the prostate was normal. In the position of the left seminal vesicle was a large stony mass which crepitated on palpation. The patient was sent to the hospital and an indwelling catheter introduced prior to operation. Cystoscopic examination prior to operation showed fair indigo-carmin on both sides with no infection of the kidneys. Behind the intra-ureteral ridge there were three diverticula orifices and in the orifice of one a stone could be seen. The bladder was markedly trabeculated and showed an acute cystitis. The neck of the bladder showed typical contraction. X-ray pictures showed practically the same as those taken by other physicians. June 12, 1925, the old incision was opened and the bladder, which was firmly adherent, was exposed with great difficulty, all the way down to the trigone. Three diverticula were

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gradually liberated and excised, the orifices being closed by ordinary sutures. One of the diverticula was full of stones. Owing to the extensive peri-diverticulitis and the thickening of the bladder-wall to 1 cm., the operation was particularly tedious and the peritoneum was opened in several places. The contracted neck of the bladder was widely stretched. On sewing up the bladder wall after closure of the neck of the diverticula it was completely extra-peritonealized by a flap of parietal peritoneum sewed down to the trigone and to the peritoneum of Douglas' pouch. Patient stood the operation very well, but subsequently developed, due to pelvic exudate, obstructive

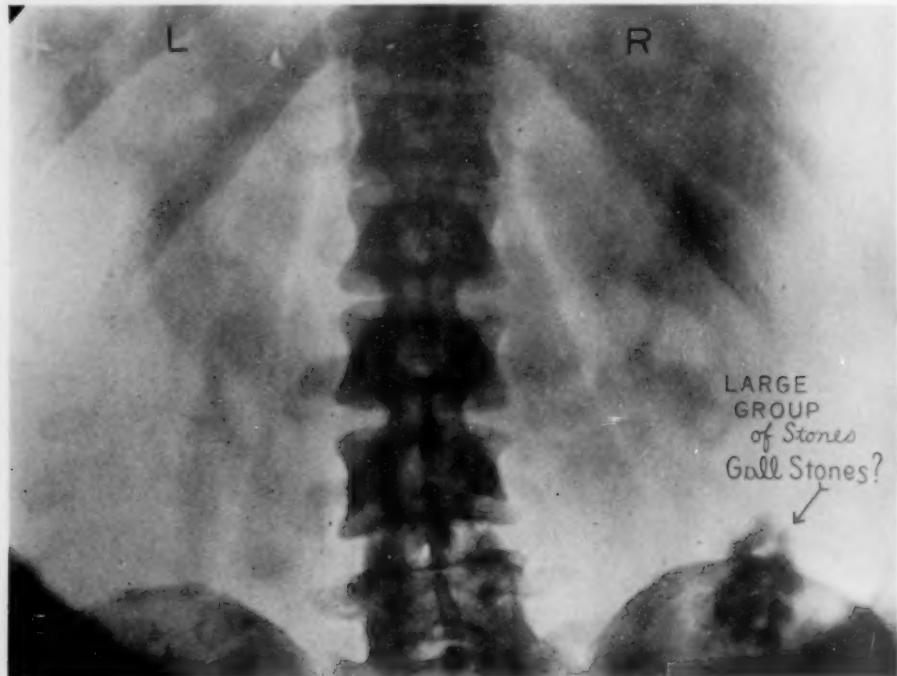


FIG. 2.—Closely packed stones in hydronephrotic kidney, situated in right iliac fossa simulating lower half of a right-sided fused kidney.

symptoms which were relieved by Doctor Colp, who did a left sub-costal jejunostomy.

The patient was recently seen; his urine is almost clear and is readily passed in good stream. He has been returned to good health.

PARTIAL CYSTECTOMY FOR TUBERCULAR
VESICO-TUBAL-COLONIC FISTULA

DR. EDWIN BEER presented a girl, twenty-two years of age, who was first seen October 11, 1923. Two years prior she had had pain on urination just before menses, which were five-weekly and lasted five to six days. Ten weeks before visit patient had a cold with severe pain in the bladder region, pain being most marked after voiding. She also had noticed well-marked constipation; during this period urine had been cloudy but never bloody. Has lost five pounds in weight and has been running irregular temperatures with occasional chills. Cystoscopy No. 1 showed normal bladder with good function

TUBERCULAR VESICO-TUBAL-COLONIC FISTULA

on both sides. Behind the trigone there was an area of œdema in the centre of which there was a small body, rather red in color, made up of numerous excrescences looking like a strawberry. On the top of this there was a small accumulation of pus as if the pus was discharging through the bladder wall from an extravesical focus. Vaginal examination showed a thickening to the left of the uterus and running down towards the posterior bladder wall opposite to the area of œdema just described. This gave the impression of a left adnexal disease and the suspicion was aroused that the trouble in the bladder was secondary to the adnexal disease. Subsequent examinations showed the following:

A catheter was passed into the strawberry-like mass on the posterior wall

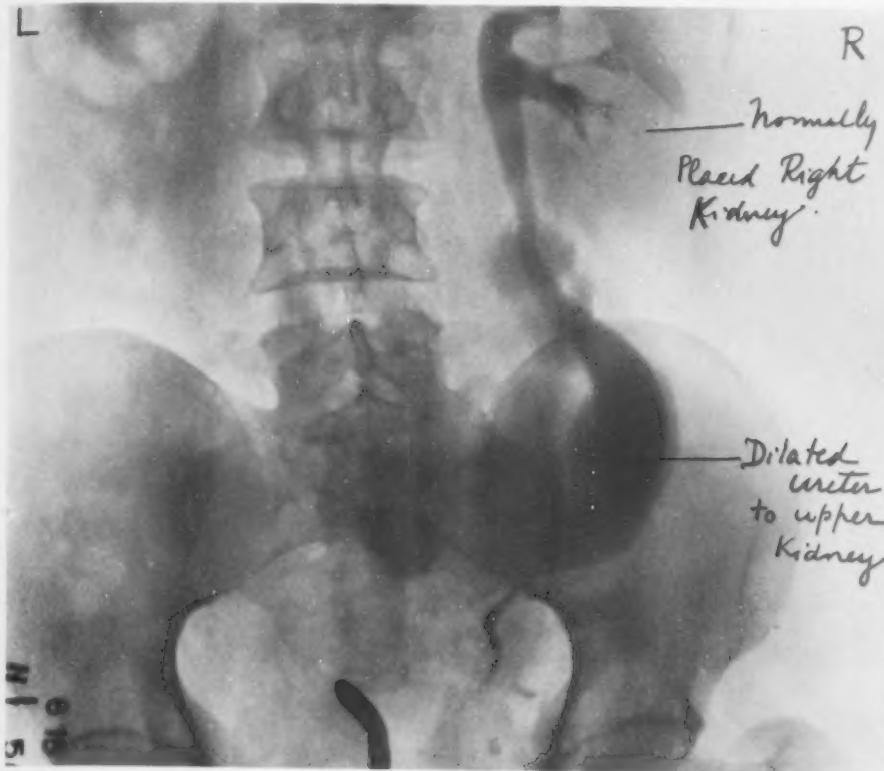


FIG. 3.—Infected left calculous hydronephrosis in right iliac fossa.

of the bladder a little to the left of the median line, and entered 12 cm. By aspirating the catheter, a quantity of thick creamy pus was withdrawn. Subsequently, three X-ray catheters were passed—one into the abscess which had perforated into the bladder, and one up each ureter—and the catheter in the sinus was injected with iodides. From the X-ray picture it was evident that the two normally placed orifices led to two normally placed kidneys, and the catheter in the third orifice ran only a short distance and, when injected, filled an irregular-shaped cavity on the left side of the pelvis and also filled a long horn-shaped cavity running in the right pelvis. The latter cavity, though less distinctly filled, was definitely horn-shaped in character. The operation showed that this incompletely filled horn-shaped body was prob-

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ably the transverse colon which had communicated with the extravesical abscess. A specimen removed from the periphery of the fistulous opening of the bladder showed definite tubercle formation. Repeated examinations of the urine failed to demonstrate the tubercle bacilli.

Bringing all the facts together then, the pre-operative study showed definitely the presence of a left tubo-ovarian tuberculosis which had perforated into the bladder. October 23, 1923, a laparotomy was performed, and on exposure, in the Trendelenburg position, the transverse colon was found firmly adherent in a mass of inflammatory tissue on the posterior wall of the

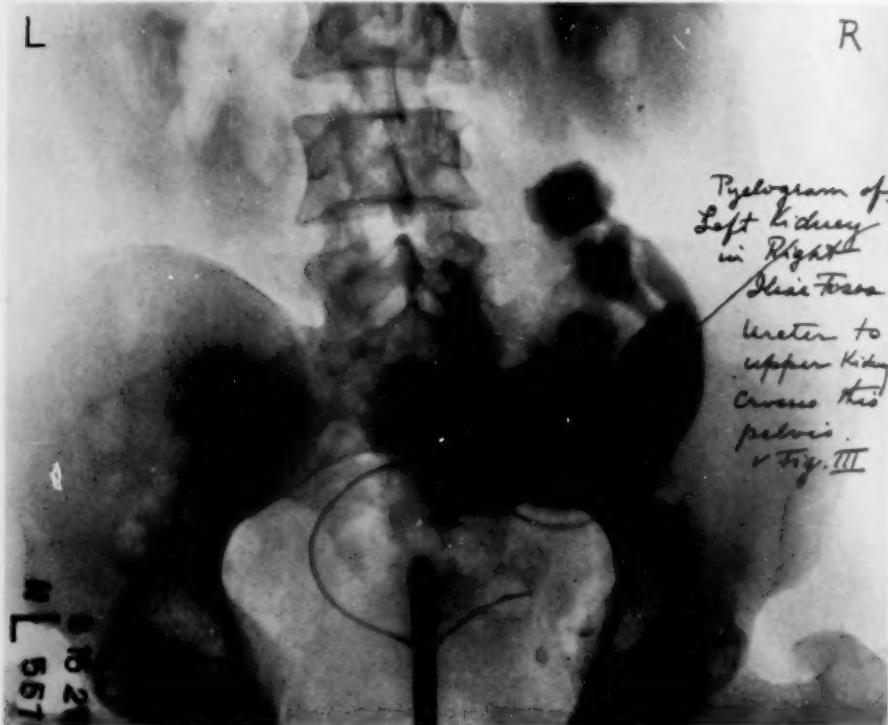


FIG. 4.—Infected left calculous hydronephrosis in right iliac fossa.

bladder. The colon was cut free and a small opening in the bowel closed. After freeing the colon, it was found that the whole pelvis was covered with tubercles both on the left and right sides, and that the left tube and ovary were matted together in a fair-sized tuberculous abscess. The left tube was cut away from the uterus and followed down to the bladder, and the greater part of the posterior wall of the bladder was removed transperitoneally. In this way the fistulous tract, the left tube, the left ovary and the bladder wall were excised in one piece. The tuberculosis of the peritoneum was so extensive that it was somewhat difficult to close the opening in the bladder. The tissues which were tuberculous had to be reuniting to close the defect. To insure closure and to prevent the colon from becoming adherent again to the posterior surface of the bladder, the uterus was suspended against the posterior peritoneal layers of sutures over the bladder. The bladder was closed completely and an indwelling catheter placed in the urethra. The patient made a satisfactory recovery though some exudate developed in the left iliac fossa which caused a little distress, some discharge and occasional rises in tempera-

TUBERCULOSIS OF THE CÆCUM

ture. This is not surprising in view of the fact that the abscess contained pus germs derived from the bowel as well as germs of the original disease. Re-examination with the cystoscope showed on the posterior wall the line of resection and near the centre of this a superficial ulceration such as one sees occasionally in the bladders of patients who have had renal tuberculosis. The suprapubic sinus closed completely and all the exudate has disappeared. Recent cystoscopy following cauterization of the ulcer with the high frequency current showed a healthy normal bladder.

INFECTED LEFT CALCULOUS HYDRONEPHROSIS IN RIGHT ILIAS FOSSA

DR. EDWIN BEER presented a man, forty-five years of age, who was first seen June 11, 1925. For two months he had been suffering from pain in the right lumbar region. There had been no haematuria and no stones passed in urine. An X-ray (Fig. 2) showed a closely grouped mass of faceted stones as large as peas on the right side of abdomen opposite the lower lumbar spine and partly overlying the iliac bone. There had never been jaundice and no disturbance in micturition. He had lost six to seven pounds. Further X-ray studies showed the above group of stones broken up so that they were scattered over a wide area. On cystoscopy, the bladder urine was found clear; ureters normal. The left ureter admitted a No. 4 Fr. catheter 35 cm., and there was no indigo-carmin excretion in forty-five minutes. The urine obtained from this side was clear macroscopically and contained .7 per cent. urea and an occasional leucocyte. There was slight retention in this pelvis. On the right side there was clear urine, no retention, no obstruction, fair indigo-carmin excretion, clear urine. Abdominal palpation showed a definite resistance in the right iliac fossa where on some examinations a definite mass could be felt.

In view of the X-ray findings and the above cystoscopy findings, the problem was to decide between a large number of faceted stones in a gall-bladder of large size, or whether there was a fused kidney which was hydronephrotic, the lower pole of which communicated by means of the left ureter with the bladder, the whole kidney being situated to the right of the spine. Further examination with the assistance of X-ray showed that the left ureter crossed the spine to the lower pole of the right kidney and this lower pole was converted into a hydronephrosis in which the stones lay. A pyelogram of what was thought to be the upper end of the fused kidney, showed this pelvis to be normal, but that the ureter was markedly dilated in the position of the hydronephrotic lower half of this kidney.

June 16, 1925, a retroperitoneal exposure was made of the hydronephrotic kidney through an anterior incision, the peritoneum being easily pushed back. The two kidneys were in no wise connected. The left kidney was found in the right iliac fossa and the ureter of the right kidney crossed this dilated pelvis over its anterior surface. The vessels entered this kidney through the upper mesial aspect. The nephrectomy was comparatively simple and the patient made an uneventful recovery. The wound healed by primary union.

TUBERCULOSIS OF THE CÆCUM

DR. EDWARD WADSWORTH PETERSON presented a man now forty-seven years of age, who was admitted to the Post-Graduate Hospital in June, 1918. His chief symptoms were a gradual loss of weight; occasional attacks of pain in the right upper quadrant of the abdomen, the pain radiating to back and shoulders; and for several months frequent discomfort in the right lower quadrant of the abdomen, accompanying a desire to go to stool and relieved

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by bowel movement. Physical examination was negative except for a tumor in the gall-bladder region and tenderness and slight resistance over the right lower quadrant. The gastro-intestinal X-ray study was negative except for a slight filling defect in the caecum.

Operation, July 11, 1918, revealed a large hydrops of the gall-bladder, due to an impacted stone in the cystic duct. There were a moderate number of tubercle-like bodies on the caecum and on the mesentery in the ileo-caecal region. The appendix and gall-bladder were removed. The pathological report showed a tuberculosis of the appendix, and a chronic cholecystitis. At the time of operation the tuberculosis was thought to be of the "peritoneal" and not of the "entero-peritoneal variety," which manifested itself a few months later.

The man recovered promptly from the operation, left the hospital two weeks later and improved for a few weeks. He was readmitted to the hospital with symptoms of intestinal obstruction, and was operated upon by the late Dr. Walter Silleck, in January, 1919. There was exposed a massive infiltration of the caecum and ascending colon and the mesentery of the right side, giving the impression of an advanced malignancy in this region. The condition was considered inoperable and the abdomen closed. Evidently a massive hyperplastic tuberculosis had developed. Intensive X-ray treatment was advised and was followed by disappearance of all the tumefaction of the right side of abdomen and by a complete relief of all abdominal symptoms.

The patient considered himself perfectly well for over six years. Early in 1925, he began to have trouble with his bowels. There were intermittent, cramp-like pains, and a feeling of fulness and flatulence. In July, 1925, he had an attack of constipation, abdominal distention, vomiting and rapid loss of weight. He was again sent to the Post-Graduate Hospital, seven years after his original operation, suffering with partial intestinal obstruction. An exploratory operation showed thickening of the ileo-caecal valve region and head of caecum, numerous scars on caecum and ascending colon and mesentery, but except for the ileo-caecal thickening, there was a complete disappearance of all evidence of the massive hyperplastic tuberculosis which had been encountered at the second operation.

A resection of the caecum would have been the operation of choice at this time, but owing to the weakened condition of the patient and the possibility of lighting up old apparently healed tuberculous foci, a palliative operation was decided upon. A lateral anastomosis between the ileum and the transverse colon was made. Patient recovered rapidly, has gained considerable weight, bowels move regularly and there is freedom from all unpleasant symptoms. X-ray therapy is being used again.

CORNEAL ULCER AFTER ALCOHOL INJECTION OF GASSERIAN GANGLION

DOCTOR PETERSON presented a man, thirty-five years of age, who had suffered from tic douloureux, right side of face, for seven years when first seen. The neuralgia attacks would start in the second division of the fifth nerve and spread downward to the third branch. The attacks were of such frequency and severity that the patient had been forced to give up his work.

In June, 1919, a deep alcohol injection of the second and third branches of the trigeminal nerve gave relief for about one year. Then pain returned

CORNEAL ULCER

and, if anything, was more severe than formerly. All three branches of the fifth nerve were now involved in the attacks.

September 25, 1920, a deliberate attempt was made to puncture and inject the right Gasserian ganglion. The effort was successful, as evidenced by the immediate complete anaesthesia and analgesia of the whole side of face and head. A rather severe neuro-trophic keratitis manifested itself several days later and in spite of prophylactic treatment went on to development of a corneal ulcer. There was also headache and temperature for a few days, but all symptoms cleared up. There had been not the slightest suggestion of tic douloureux since the injection. Anaesthesia and analgesia had persisted for over five years.

The average period of relief following the deep injection has been from six months to one year, in exceptional cases much longer. After successful ganglion puncture and injection—as evidenced by immediate anaesthesia and analgesia of all three divisions of the fifth cranial nerve, followed later by neuro-tropic keratitis—the effect was much more lasting, and in some instances the cure seemed permanent. The shortest period of relief was over four years in his cases.

He no longer performs this operation, however, believing the division of the posterior root, according to the Cushing or Frasier technic was safer and more certain and the relief of the pain was permanent.

DR. HERMAN FISCHER, speaking about the treatment of trigeminal neuralgia with alcohol injections, said that he had had the opportunity to treat about fifty of such cases and in general the results were quite satisfactory. He never injected the Gasserian ganglion and he believed that alcohol injections into the Gasserian ganglion had been given up by most surgeons, on account of its dangers and the uncertainty to guide the needle. He personally knew of serious results in two cases, in one, a subdural abscess developed, and in the other a physician, well known in New York, developed multiple brain abscess with fatal termination after a number of such injections. In most of his cases the second branch was involved and many patients became entirely free after one injection into the infra-orbital foramen and remained so for a number of years. In about one-half of the cases the pain recurs after a shorter or longer interval. After they have been injected several times, however, they rarely get a long interval of relief, the longest period being about six to seven months. A third injection rarely does any good whatever. In such cases the speaker usually recommends resection of the nerve and after the operation a good many patients in whom the alcohol injections failed were cured. In none of the cases has he had the opportunity to do a section of the posterior root of the ganglion. He had one case, a man who had recurrence of the tic four or five times and an effort was made to persuade him to have ganglion section done but he refused to consider it. He later came back and an excision of the nerve was done. He still had pain when he left the hospital, but two weeks later reported that he was absolutely free of pain and has remained so ever since.

The speaker is of the opinion that root section should be reserved for the cases which cannot be cured by these simpler methods.

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HIGH ULCER OF LESSER CURVATURE OF STOMACH

DR. FRANK S. MATHEWS presented a man, the subject of ulcer of the lesser curvature, to call attention to points of treatment in such cases, resection of the stomach in such cases being impossible without sacrificing practically all of it, and a local resection at times being difficult because of its location and the probable encroachment of the suture line upon the cesophagus. The man was fifty-four years of age. X-ray revealed the high location of the ulcer. When admitted to the hospital, he was profoundly anaemic from hemorrhages. After transfusion, a high incision in the left rectus was made, a subacute gall-bladder containing impacted stones was removed, and the ulcer excised and sutured transversely. Because of its high location and absence of gastric retention and the patient's enfeebled condition, a gastro-enterostomy was not added. Very soon after operation, it became apparent that the operation was not a complete success. There was no further hemorrhage but pain and heartburn continued. Six months later there was large residue in the lower gastric pouch and the stomach symptoms had continued and increased. At re-operation, an ulcer was found at the original site which had perforated toward the liver and posterior abdominal wall. Stomach was freed with difficulty and re-sutured, nothing being done with the extra-gastric part of the ulcer crater. A posterior, no-loop gastro-enterostomy was added. This was six months ago and improvement began at once. He seems now clinically well and is working. Doctor Mathews showed the case, first, to emphasize Doctor Lewisohn's point that these unusually high ulcers constitute a special clinical group. Second, the case illustrates the need of the gastro-enterostomy in addition to excision. Third, Mr. Walton, in discussing the high ulcers which are often quite large and extensively indurated and difficult of local resection, has suggested that they might be treated by gastro-enterostomy alone as a first operation. He thinks 40 per cent. would heal. If the symptoms are not relieved, a subsequent operation would find the ulcer smaller, less indurated and more favorable for excision.

DR. JOHN C. A. GERSTER reported a case of ulcer seen three years ago, clinically a carcinoma, and so close to the cardia that only a gastro-enterostomy was done. The patient is quite well at present.

DR. EDWARD W. PETERSON recalled a case of ulcer situated high up near the cardia that he had operated upon fifteen years ago. It was not quite so high as that shown by Doctor Mathews, but it had penetrated, and he had excised the callous portion and closed the opening, which caused much deformity of the stomach and did nothing further at this time. The patient remained well for five weeks and then had a recurrence of ulcer symptoms. A gastro-enterostomy was then performed and the man has remained well ever since.

ARTHROTONMY FOR KNEE-JOINT CALCULI

DR. JOHN J. MOORHEAD read a paper with the above title, for which see *ANNALS OF SURGERY*, p. 392.

DOCTOR MOORHEAD in illustration of his paper presented the following patients:

CASE I.—A boy, nine years old, who in summer of 1924, wrenched his knee. The joint filled with fluid and he became lame. The condition subsided with strapping. He had a recurrence under similar circumstances a few months

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later. First seen by the reporter, December 3, 1924, one month before the knee had again become swollen and lame. Examination at that time showed a distinct synovitis; there was no localized tenderness; some crepitation and distinct limitation in folding and unfolding the joint. December 4, at the Post-Graduate Hospital about 30 c.c. of clear thick yellow fluid was aspirated from the joint and 5 c.c. of ether injected. There was considerable post-operative reaction in the form of swelling and tenderness. December 8, he reported saying that when he put his knee into extension from flexion there was a decided catch and to overcome this he "flipped the joint." December 19, he reported that definite locking of the joint had occurred several times. Accordingly, December 26, a medio-lateral arthrotomy was performed. It was then found that he had a fracture of his internal semi-lunar cartilage, with numbers of adhesions in the upper part of the joint and a thickening of the synovial folds. The adhesions were released and three-fourths of the antero-internal portion of the cartilage excised. He was given the usual post-operative care, namely, immediate mobilization beginning two hours after the operation. The function of the joint is now perfect, and since the time he left the hospital he has had no knee difficulty.

CASE II.—A married woman of thirty-eight, who, without any definite history of injury, had intermittent pain and swelling of the left knee for six years. Stiffness of the joint was marked on overuse; she also found difficulty in using it after it had remained in one position for any length of time. In childhood this same knee had been aspirated following scarlet fever. She was first seen in April, 1925, and at that time there was definite crepitation in the slightly swollen joint; there was inability to flex it beyond a right angle and the entire limb seemed smaller than the opposite mainly due to some quadriceps atrophy; there was no localized tenderness and a diagnosis was made of osteo-arthritis, and this apparently was confirmed by X-ray. May 2, a medio-lateral arthrotomy was performed. It was then found that the internal semi-lunar was movable, irregular, and that there was a marked thickening of the synovial membrane with hypertrophy of the sub-patella fat pads. The cartilage was removed, fat pads excised and the excess folds of synovia removed. Post-operative treatment was as in the foregoing case. The outcome has been exceedingly satisfactory despite the fact that in origin her articular condition was doubtless a combination of injury and infection.

CASE III.—A man, twenty-eight years of age, a football player, who was first seen in November, 1924, with a history of having wrenched the left knee the previous July. There was immediate post-traumatic swelling and pain and he did no work for seven weeks and then a recurrence of pain and swelling caused idleness for two weeks. When first seen he had marked cracking of a swollen joint, excess lateral motion and localized tenderness over the internal semi-lunar. A diagnosis was made of semi-lunar injury and he was operated on at the Post-Graduate Hospital, December 22, 1924. The internal semi-lunar was found fractured and displaced. He had adhesions also in the superior pouch and hypertrophic fat pads. The usual post-operative treatment was given and he walked on the fifth day and left the hospital on the seventh. There is now no limitation of motion and his present complaint is that after unusual use the joint is somewhat weak.

CASE IV.—A man, thirty-nine years of age, who was first seen in October, 1925, the history being that for a long time without any apparent cause so far as he knew, his left knee when twisted in a certain way became painful, and on occasions a small bean-sized mass was apparent on the inner

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margin of the joint. When this could be seen and felt the knee would remain bent until by pressure and manipulation this small mass reentered the joint. The mass extruded particularly when he was playing golf. Examination showed a swollen knee which lacked about 50 per cent. of full flexion and which showed some tenderness over the internal semi-lunar cartilage. X-ray examination was negative. There was no calculus palpable. November 9, a medio-lateral arthrotomy was done at the Post-Graduate Hospital and a fracture of the internal semi-lunar was found; the inner edge of the cartilage was curled upon itself and was attached to the main portion of the cartilage by a thin band and in certain motions of the joint this attached portion extruded itself. The synovia was thickened and some of the fat pads were enlarged. It is now sixteen days since his operation and he is exhibited as a recent post-operative case to show the immediate after-effect of such an operation and the range of motion obtained by the practice of immediate post-operative mobilization. As will be observed the joint is swollen and he is able to bend it to a little more than a right angle. This appearance corresponds to what is seen of the majority of cases and as the periarthritis subsides the motion will increase so that at the end of three or four weeks more he will doubtless have practically a normal appearing and normal acting knee.

DR. CHARLES GORDON HEYD asked Doctor Moorhead if he favored a smaller incision in simple dislocation of the internal cartilage. The Jones incision has given excellent results with a minimal degree of deformity. In regard to the patella split, while it gives a most admirable exposure of the joint and the ligaments it represents a prolonged hospitalization and a long period of disability before free movement is obtained. During the war he had recourse to a parapatella incision, one that extended on either side of the patella and did not bend either above or below the patella. The exposure was adequate and the recovery with active mobilization surprisingly rapid. Doctor Moorhead's operation had all the advantages of a very beautiful exposure and the application of surgical principles was comparable to those that govern work in the abdomen. It is surprising to notice from the tabulated statistics the remarkably early return of these patients to their feet with comparative comfort. The patient presented illustrated this very well. He was operated upon November 9, just sixteen days ago, and he walks with as slight a limp as would ensue after a laparotomy. There has been too great a tendency to regard the knee-joint as a place not to be entered. This is an erroneous idea, for which proper aseptic and precautionary technic the knee-joint lends itself quite as readily to surgery as the abdomen and the return to function is excellent and within a remarkably short period of time.

DR. FREDERIC W. BANCROFT said that it was surprising how large these foreign bodies in the knee-joint can be. In one of his cases the patient had had a foreign body one and one-half by one-half inch in diameter removed from the supra-patella bursa. This foreign body appeared like a joint cartilage which had had increasing amounts of calcium deposited around it. It had had no pedicle and was free in the joint. Doctor Bancroft

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showed the lantern slides of this case. High-powered photomicrographs revealed a connective-tissue membrane with nuclei present in the cells. Beneath the membrane were numerous cartilage and bone cells with active staining nuclei. The centre consisted of a morphorous calcareous material. He stated that the bone must obviously have a low metabolic rate for the cells to retain their nourishment without any active circulation. The cells must have obtained their nourishment from the seipage of the synovial fluid. This low metabolic rate may explain why the nuclei of the cells in a bone transplant occasionally maintain their nuclear stain after insertion.

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ISOLATED DISLOCATION OF THE FIRST METATARSAL BONE

EDITOR ANNALS OF SURGERY:

Sir:

Isolated dislocations of the first metatarsal bone are quite rare in the literature. In 1915, when the following case was seen, only 16 cases were



FIG. 1.—Isolated dislocation of the first metatarsal bone.

found in the records. There are probably many others unrecorded, especially since the Great War, as most of these injuries are caused by falling from a horse or by severe direct trauma. My case occurred in the person of a laboring man, thirty-five years of age, who was struck on the top of the foot by a

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barrel. Great pain ensued and the man was unable to walk. He was seen immediately. The foot was found markedly foreshortened and with an extremely high arch. The first metatarsal bone was palpated as dislocated internally and upward. X-rays confirmed the diagnosis. Nitrous oxide was administered and the metatarsal bone reduced with great ease. The arch at once returned to normal and the foot resumed its normal appearance. A support was worn for about six weeks and the ultimate result was a complete cure. The X-rays show a complete dislocation of the first metatarsal from the others and from the tarsus, without fracture.

CHARLES E. FARR, M.D.,
New York, N. Y.

ACTIVE MOTION IN THE TREATMENT OF FRACTURES

EDITOR ANNALS OF SURGERY:

Sir:

As late Surgeon and now Consulting Surgeon to the Edinburgh Royal Infirmary, I was exceedingly interested to think that the principle of active movement had been considered in America. The article published in the October number, 1925, on "Active Motion in the Treatment of Fractures," by Doctor Stevens and Doctor Yates, is of great interest as this method of treatment has been taught and practiced by me for twenty-five years, and there are now many medical men all over the world who are carrying out this method of treatment. The results have been so uniformly rapid and good that I cannot understand why it has not more speedily gained hold. In December, 1924, Oliver and Boyd, of this city, published a work by me entitled, "The Principle of Active Movement in the Treatment of Fractures of the Upper Extremity," and this embodied my experience of twenty-five years. The treatment, in short, consists in active movement, short of pain, constantly and frequently carried out. No splints are used except in the first few nights to prevent painful displacement. Even if displacement occurs, it straightens out during the day. The forearm is supported by a sling and the angle at the elbow frequently altered to prevent stiffness in that joint.

Take a case of fractured clavicle. Such a patient ought to be able to return to work as a clerk in a matter of a week, putting on his own clothes, opening the door, and writing quite well. If it was considered quite apart from Surgery, what an advantage this is to a married man to be again a wage-earner in a short time. But that is not the only point to look at. Think what an asset it is to a State and to Insurance companies if such a man can be back to work a week sooner than by other treatment, and with a better result. A hundred fractures a year going to work a week earlier means a hundred weeks more work for the State in a year.

So impressed have I been, in comparison with other methods of treatment, that I consider active movement short of pain to be a new principle in Sur-

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gery, and I have applied it with the greatest success in the suture of divided tendons, the use of the knee-joint after removal of the semi-lunar cartilage, and in cellulitis affecting muscles, where the active movement short of pain helps to "pump" out the pus. Suppurating joints I have treated always on this principle and have had most excellent results except where the bacillus pyocyaneus is present, an organism very fatal to cartilage.

There is no hesitation in saying that this principle is a great advance on splints, massage and passive movement, which are the use of another person's muscles and brain and not the sufferer's.

J. W. DOWDEN, M.D.,
Edinburgh, Scotland.

THE EXCISION OF INTERNAL HEMORRHOIDS

EDITOR ANNALS OF SURGERY:

Sir:

Thirty years ago, after having discarded the use of the clamp and cautery and Whitehead's operation in the removal of hemorrhoids, while I was casting about for some more satisfactory method I saw a statement by Gallant

(*Mathews' Medical Quarterly*, October, 1894), that Doctor Outerbridge had been excising individual pile tumors and closing the wound with catgut sutures. This appealed to me very strongly, and after having followed it for some time it



FIG. 1.—Forceps for compressing the base of hemorrhoids.

occurred to me that I might do it much more satisfactorily and speedily if the hemorrhoid could be held by a clamp while being sewed and excised. This would facilitate also preventing the opposite walls of the adjacent hemorrhoids from being included in the sutures of the wound that was being closed. This was accomplished by devising the pile forceps shown in the accompanying cut (Fig. 1). These forceps have conical-shaped blades, adjusted to the handles at an angle of about thirty degrees with serrated edges, but not stout enough to bruise the tissue when closed by the catches at the base of the handle.

A similar suggestion had occurred to Doctor Parkhill about the same time without his having known anything of what I had done. In order to authenticate the right of priority I give the dates on which each method was first published:

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Earle, *Mathews' Medical Quarterly*, January, 1896. Parkhill, *International Journal of Surgery*, May, 1900.

Earle's Method.—With the patient prepared for operation in the usual manner and the patient placed under either a general or local anaesthetic and the parts thoroughly cleansed, the hemorrhoids are caught either with a Kelly or a T-forceps and dragged down well out of the anal canal. Each internal hemorrhoid is then caught with the Earle clamp at its base, in the line of the long axis of the rectum; a needle with a number two chromic catgut suture is then passed back and forth beneath the toe of the clamp and tied, the suturing is then continued back and forth until it reaches the heel of the forceps when the portion of the hemorrhoid above the clamp is cut off with a sharp knife as close as possible to the blades of the forceps, the forceps are then removed and the suture tied at the base. Each succeeding hemorrhoid is dealt with in the same manner (Fig. 95).

It is to be remembered that the clamp is not to include any but the internal hemorrhoids down to Hilton's white line. If there are external hemorrhoids, or skin tags, they are to be dealt with separately as follows:

If the external anal ring is surrounded by large clusters of varicosities, I take a horizontal strip of skin from each side of the anal canal, extending from the anterior to the posterior commissure and with mouse-tooth forceps and scissors I dissect out all the varicosities with the superabundant tissue, and tie with plain catgut all spouting vessels. I then remove sufficient of the superabundant skin to allow the cut edges to approximate each other nicely. Later applying a compress after the thighs have been extended and brought together which will keep the cut edges neatly approximated.

If there are only a few and distinct clusters of varicosities I take out an elliptical piece of skin parallel with the rugæ of the skin made by the contraction of the sphincter from the most prominent part of each and dissect out the varicosities as before described. I also remove a sufficient amount of redundant skin to make these cut edges approximate evenly.

If there are only skin tags I cut them off, being careful to remove sufficient amount of redundant skin at their base to make the cut edges approximate evenly.

I then give a sixth or a quarter of a grain of morphia hypodermically and repeat at proper intervals as required by the pain, which will also confine the bowels until the fourth day; it is generally only necessary to give one, or two hypodermics. I only confine the patients to liquid and soft diet for the first day after the operation, then give them fruit and vegetables. I begin with liquid petrolatum in ounce doses the second night after the operation and continue it until the patient is well.

I apply to the wound the following day after the operation Pilcher's quino-formol solution which is a less irritating than the chlorinated solution of Dakin; this is applied with a sponge which is renewed every two or three hours during the day. On the morning of the fourth day I give a mild laxative to be followed by an enema of one pint of plain tepid water after

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there has been some inclination for a movement of the bowels. The patient is allowed to be up on the third day and generally leaves the hospital from the fifth to the seventh day.

This method was again fully described by me with illustrations in my book on *Diseases of the Anus, Rectum and Sigmoid*, published in 1911 by J. B. Lippincott Company.

SAMUEL T. EARLE, M.D.,

BALTIMORE, MD.

AMOEBOIC ABSCESS OF LIVER WITH RUPTURE INTO INFERIOR VENA CAVA

EDITOR ANNALS OF SURGERY:

Sir:

A survey of the literature shows that amoebic abscess of the liver with perforation into the inferior vena cava is extremely rare. Flexner,¹ in 1897, in reporting two cases, states that he found only one other reported case, that of Colin in 1873. Cyr's statistics, quoted by Strong,² show that of 159 cases rupture occurred into the lung in 59; into the pleural cavity in 31; into the peritoneal cavity in 39; into the intestine in 8; into the stomach in 8; into the vena cava in 3; into the kidneys in 2; into the bile ducts in 4; into the pericardium in 1; externally in 2. No more recent cases have been found. The condition has probably never been recognized during life. To the following recent case therefore must attach much interest.

E. G., single, white, machinist, aged twenty-two, was admitted to the Louisville City Hospital, July 25, 1925, with a diagnosis of acute cholecystitis. His personal history was of no consequence except for a similar attack eight months before. There was no history of dysentery and he had never been south of Kentucky. Illness began five weeks before admission with drowsiness, anorexia and loss of strength and of weight. Three weeks later he began to have dull, gnawing, intermittent pain in midline of epigastrium, radiating around right costal margin. Pain was worse at night. Vomiting of food and blood-streaked bile occurred about thirty minutes after meals. About a week before admission he became jaundiced, this persisting for three days. Following this were chills and fever with swelling of feet. About an hour before admission he was seized with a severe cramping pain in right upper quadrant.

Physical examination on admission showed nothing abnormal in the thorax and lungs except slight limitation of motion at the right base. There was a fulness in the right upper quadrant of the abdomen. Palpation revealed a tender mass the size of a half grapefruit extending downward from beneath the costal margin. There was very little muscle rigidity. Temperature was 100, pulse 130. A blood count showed red blood-cells, 2,500,000, white blood-cells, 18,400, with 82 per cent. polymorphonuclears. A diagnosis of acute cholecystitis was made and operation advised. This was refused. The next day he was given a transfusion of 500 c.c. of citrated blood following which red blood-cells rose to 3,100,000, white blood-cells to 25,200, and his condition seemed improved.

Operation was accepted July 28, 1925. The laparotomy revealed a large liver extending nearly to the crest of the ilium, with delicate adhesions to surrounding structures. The gall-bladder, appendix and pancreas were negative. A prominent, firm area

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in the right lobe of the liver, high up under the costal margin, almost in the midline, was aspirated and thick yellow pus obtained. Incision along the needle opened an enormous cavity in the right lobe, from which much pus was evacuated. From this cavity severe hemorrhage began which could be controlled only by firm packing. Due to the precarious condition of the patient, the wound was hurriedly closed, leaving the packing in place. Careful warm stage examinations of the material showed cell debris, red blood corpuscles and a few pus cells, but no amoebæ. Smears and cultures were negative. Blood culture August 12 was sterile. August 15, 200 c.c. of bloody fluid was aspirated from the right pleural cavity. No amoebæ were found in this fluid and cultures were sterile. Death occurred August 18 with signs of respiratory failure.

At autopsy two hours post-mortem the peritoneal cavity was found to be normal except in the right upper quadrant, where intestines and omentum were matted to the gall-bladder by a fibrinous exudate and delicate fibrous adhesions. The liver margin extended to the umbilicus in the midline and was firmly adhered to the abdominal wall. The diaphragm extended to the third rib on the right and the third interspace on the left. The right pleural cavity contained about 1000 c.c. of blood stained fluid. The left contained about 200 c.c. of similar fluid. The gastro-intestinal tract showed no signs of fresh or healed ulceration. The liver, after drainage of the abscess, weighed 3130 gms. Practically the whole of the right lobe was destroyed by the abscess, which contained about 2000 c.c. of typical thick, reddish-brown, anchovy sauce fluid. Upon removing the liver this fluid poured from the upper end of the portion of vena cava included with the liver. The lower end of this portion of vena cava was partly occluded by an adherent thrombus. The vena cava above this thrombus communicated through a ragged opening 1 cm. in diameter with the cavity in the right lobe of the liver. The intima of the vena cava at this point was covered with a shaggy fibrinous exudate. The thrombus in the vena cava partially filled its lumen to a point 3 cm. below the bifurcation. The walls of the abscess averaged 2 cm. in thickness, the inner zone composed of firm, fibrous tissue, surrounded by compressed liver tissue.

Many motile amoebæ *hystolitica* were found in scrapings from the walls of the abscess. Cultures from the abscess showed *staphylococcus albus*.

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BOOK REVIEWS

PLASTIC SURGERY OF THE NOSE. By J. EASTMAN SHEEHAN, M.D., Chief of Nose and Throat Clinic of the New York Post-Graduate Medical School and Hospital. 8vo, cloth, pp. 245. Paul B. Hoeber, Inc., New York, 1925.

This volume of 245 pages is devoted entirely to the plastic surgery of the nose. The object of the book is to present as systematically as possible a series of procedures for the correction of nasal deformities that have been almost completely standardized. There are fifteen chapters, namely: Introduction, which contains many important general principals, The Nose, which considers the origin of deformities and a comprehensive Table of Corrections, Preparation of the Patient, Typical Operation giving the Reduction of Hump Nose, Correction of Twisted Nose, Depression of Nasal Bridge, Deformities of the Nose Tip, Deflected Septum, Deformities of the Alæ, Methods of Treatment of Rhinophyma, Paraffinoma and Recent Injuries, The Syphilitic Nose, Rhinoplasty, Skin Grafts, Occasional Disfigurements—and lastly the Appendix in which Intratracheal Insufflation in Anæsthesia is considered.

The author has devoted the past six years to this very special branch of surgery. After reading the book it is readily realized that constant application to this type of work is indeed necessary. It is the application of sound principles of anatomy and surgery by a well-trained capable surgeon. The importance of this kind of work is evident because at the present time many of the great hospitals and schools of medicine are applying themselves to this particular task. As an example of an extremely highly specialized type of work, this book is most sincerely commended. MERRILL N. FOOTE.

ABDOMINAL OPERATIONS. By SIR BERKELEY MOYNIHAN. Fourth revised edition, in two octavo volumes. W. B. Saunders Co., Philadelphia and London, 1926.

Since the publication of the first edition of this work in 1905, twenty years have elapsed, during which time revolutionary strides have been made in all aspects of abdominal surgery. This has been particularly evident during the last decade, dealing not only in changes of standardized operative procedure but in pre-operative and post-operative care of cases.

The presentation of the subject of abdominal operations by Sir Berkeley Moynihan, not only represents naturally the present-day concept of surgery in England as practiced by its most prominent exponent, but in addition that of all other nations, owing to the wealth of references and the endeavor of the author to properly credit other surgeons with operative procedures and items of technic devised by them. Any and all methods which are not actively used by surgeons in general have been omitted. Thus it is to be noted that

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the technic of the use of buttons and bobbins in stomach and intestinal operations has been deleted, as has any other reference to the use of mechanical appliances for anastomosis.

The general scope of the two volumes embraces only those operations common to both sexes, there being no consideration of gynaecological operations or of any organs not entirely intraperitoneal. Thus the work does not include any reference to surgery of the kidney or bladder and similarly the subject of hernial repair has been omitted.

The first section of the three, comprising volume 1, takes up the item of General Considerations in the utmost detail, as the author feels that on a proper realization of these elements depends, in a great many instances, the success of the case in question, and conversely misobservance or misconception of them frequently results in the disaster which not infrequently follows a perfectly executed technical operation. Eight chapters are included, in this section, covering the consideration of the bacteriology of the stomach and intestines; the pre-operative preparation; the conduct of the operation itself and the after-treatment of the patient. This is followed by an exhaustive chapter on the complications and sequelæ of abdominal operations in which the question of etiology and treatment of such major occurrences as peritonitis, lung complications, parotitis, post-operative haematomesis, acute dilatation of the stomach, phlebitis and thrombosis, post-operative obstruction, acidosis and ketosis are carefully considered, knowledge of which processes is not only absolutely essential to a favorable outcome, but which may lead to the institution of prophylactic measures which, if exhibited early enough, will frequently anticipate and, in many instances, prevent their development and establishment. Treatment of gunshot wounds of the abdomen and specific indications of wounds of the various viscera is followed by the consideration of tuberculous peritonitis and subphrenic abscess and finally the various surgical procedures to combat visceral prolapse and intestinal stasis. In the latter instance the author believes that when surgery is indicated, an ileocolic resection as far as the hepatic flexure answers all purposes and is far safer than the more formidable colectomy which Lane practices. An interesting controversy is engendered by the author's non-acceptance of the far-reaching tenets of Lane and the clear-sighted normal, conservative position taken by him surely reflects the opinions generally held.

The enormous experience of the author in dealing with pathologic conditions of the stomach and duodenum is related in the second section of volume one, comprising thirteen chapters, and reflects to a large degree his consideration of this subject in his previous well-known publications dealing with the same problems. It is to be noted that in the light of late sequelæ in conservatively treated cases of gastric ulcer, the author feels that the only rational procedure in these cases is a gastrectomy. The profusion and clearness of the illustrations of the various steps of operation and subsequent anastomosis are very commendable. This applies equally well to the succeeding section on the subject of operations upon the intestines which comprises

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six chapters in the first volume and is continued in volume 2 by the introduction of nine more chapters. The subject matter in no way departs from the principles generally accepted and the newer procedures which have been demonstrated as most feasible have been introduced.

The remainder of volume 2 contains the consideration of operations upon the liver, pancreas and spleen. The wealth of material afforded the author enables him to speak with authority on the many complicated conditions and with particular directness relative to their proper treatment. Throughout the entire volume is noted new, rearranged or revised subject matter which is the result of the recognition of newer methods and the judgment gained from a still broader experience. The recitation of case histories not only quoted from personal cases but of experiences of other surgeons gives the book a clinical character that lends itself to the interest of the reader and is somewhat of a departure from the usual works on abdominal surgery.

JAMES T. PILCHER.

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